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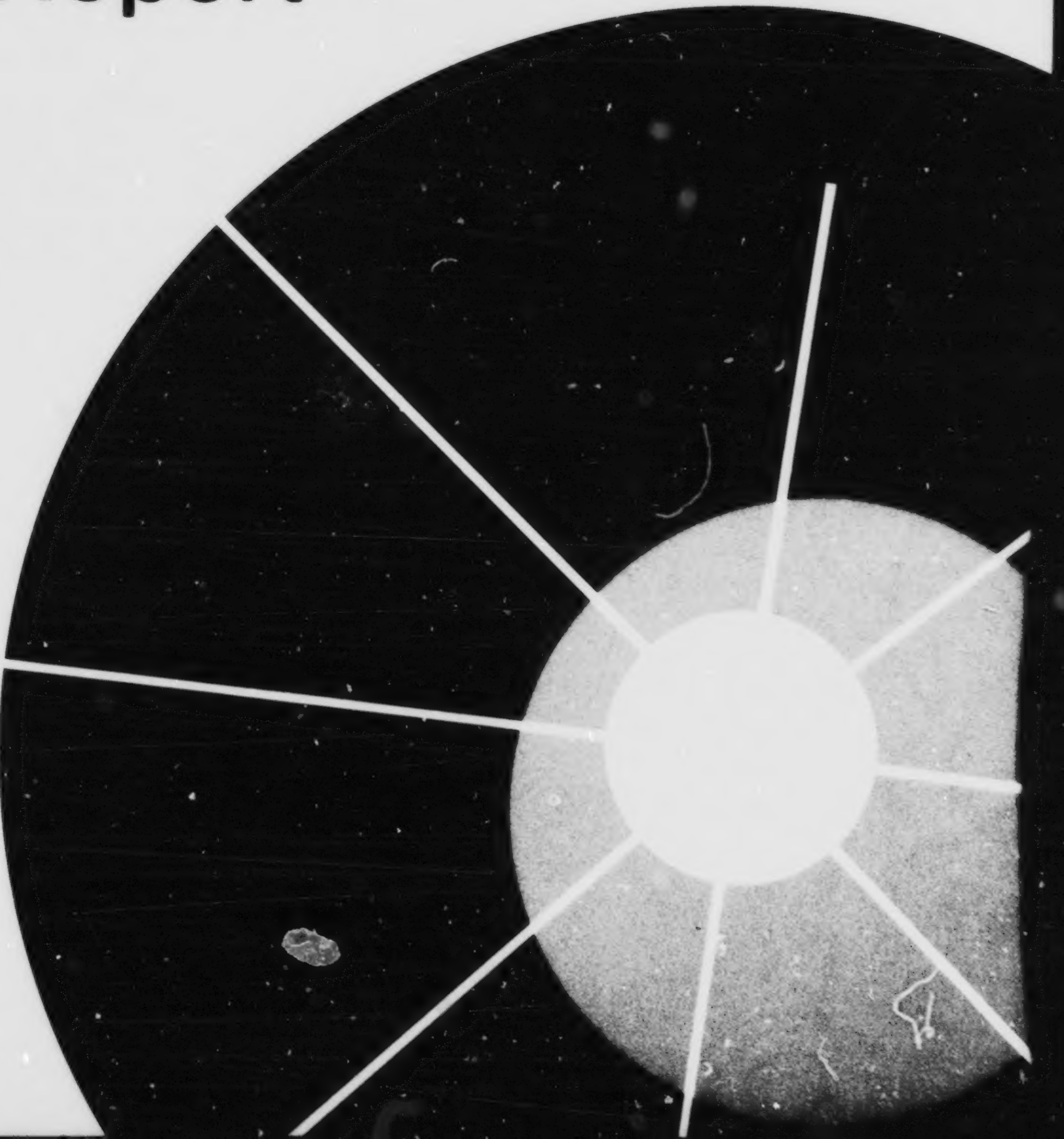
Canada - Saskatchewan Renewables — Conservation Demonstration Program

Final Report



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CANADA-SASKATCHEWAN CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

On March 18, 1980, the governments of Canada and Saskatchewan entered into a Conservation and Renewable Energy Demonstration Agreement. The Agreement, which terminates March 31, 1984, funds the development and demonstration of a wide range of conservation and renewable energy technologies. The program is funded on an equal cost-shared basis by Canada and Saskatchewan, and is administered by Saskatchewan.

The objectives of CREDA are:

- To develop and demonstrate promising new technologies which exploit renewable energy resources, conserve energy, or make its use more efficient;
- To create employment in new or existing industries;
- To develop broad public awareness of the potential of renewable energy and energy conservation technologies.

This report outlines the results of a project funded by the Government of Saskatchewan as represented by Saskatchewan Energy and Mines, and the Government of Canada as represented by Energy, Mines and Resources Canada, under the terms of the Renewables-Conservation Demonstration Program, and contracted with the party identified herein.

However, neither the Government of Saskatchewan as represented by Saskatchewan Energy and Mines, nor the Government of Canada as represented by Energy, Mines and Resources Canada, accept liability for any errors, omissions, or inaccuracies that may; be included in or derived from this report, nor do they assume any liability with respect to the use of, or actions resulting from the use of, any information contained in this report.

Tisdale Energy-Efficient Recreational Complex

SASK. 24

Final Technical Report on a Renewables-Conservation Demonstration Program Project

Conducted By

The Town of Tisdale

And Supported By

Saskatchewan Energy and Mines
and
Energy Mines and Resources Canada

Miscellaneous
Report FP-24

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INTRODUCTION:

The Tisdale Recreation Centre was opened in Fall 1982. Stage I consists of:

- Hockey Arena
- Curling Rink
- Community Centre (lounges, meeting rooms and a pistol range)

Stage II will add an indoor swimming pool.

The total facility is attached to an existing 15 classroom Public School including a 650 seat auditorium/gym.

During the design period, a grant was approved under the Canada-Saskatchewan Renewables Conservation Demonstration Program to assist in funding special equipment and construction techniques intended to conserve energy.

1) Skylights in the main lobby to attempt to capture more solar gain and supplement the lighting.

2) A dimming control system for the lighting in the arena and curling ice areas.

3) Extra insulation in the walls and roof of the Community Centre.

4) Reverse cycling air conditioning units complete with a water loop for storage and transfer of excess heat from zone to zone. Reclamation of heat from the refrigeration equipment and transfer of this heat to the low temperature

water loop in an attempt to avoid losing energy from within the system.

5) An automatic control system is provided in an attempt to control all equipment for maximum efficiency.

An integral part of the Renewables Conservation Demonstration Program is a monitoring program to determine the economic viability of these special items.

In 1982 Huckerby Consulting Engineering Ltd. was commissioned to undertake this monitoring program. Sub-consultants for various disciplines were:

Architectural - de Lint Architects Ltd.
Mechanical - Hooker Engineering Ltd.
Electrical - Saskmont Engineering Ltd.
Thermographic - Thermal Focus Ltd.

The Tisdale Recreation Centre is a new building and hence there are no records of energy consumption without the special features. In order to try and arrive at a reasonable comparison, the Humboldt Uniplex was selected to undergo a similar monitoring program. The Humboldt Uniplex is of comparable size and utilization.

Areas of each building are approximately:

Humboldt	9383 sq. m.
Tisdale	6633 sq. m.

During 1982 the monitoring systems were designed, equipment ordered and installation contracts arranged for. Financial considerations required a reduced monitoring level of the Humboldt Uniplex as compared to Tisdale, however, every effort was made to try and identify energy costs of all major systems in Humboldt.

Monitoring started the last week of January 1983.

The objectives of this report are to examine the electrical and natural gas consumption of the three main areas of the Tisdale Complex and the Humboldt Uniplex:

Arena
Curling Rink
Community Centre

The identification of energy consumption for the three areas is accomplished by a series of metering devices to isolate consumption of the various major pieces of equipment or electrical circuits.

The energy, whether natural gas or electrical, is converted to equivalent KWH for direct comparison. The total cost of the energy for the two complexes is also compared on a square meter basis.

A comparison is made of the total operating energy costs for the two facilities in an attempt to determine the effectiveness of the special items which were introduced into the Tisdale Complex.

The original design of the facility included a computer projection of anticipated savings which the special energy saving features were expected to attain. Actual costs for the first period of operation are compared with the theoretical costs.

ARCHITECTURAL

CONSTRUCTION

Humboldt

The construction of the Humboldt complex consists of a 20 cm concrete block building on structural concrete grade beams, piling and a steel truss roof system complete with steel deck. Insulation is 5 cm rigid to exterior walls of community centre and 5cm rigid to roof deck except in areas where exposed pre-finished metal roof panels are used , in which case the insulation is 10 cm batt insulation.

Tisdale

The general construction in this complex consists of concrete block complete with granular insulation in arena and curling areas with the remainder a brick veneer over steel studs complete with 5 RSI insulation.

The steel roof deck has 3.5 RSI insulation.

Special features in Tisdale are the inclusion of Kalwall skylights .44 RSI over the main lobby area and glazed walls to the northwest for solar gain.

THERMOGRAPHY

Thermal Focus Inc. was commissioned to undertake a full peripheral external infra red scan as well as selected internal scans for both the Humboldt and Tisdale complexes.

These scans were carried out late February and early March 1983. These thermograms were recorded in hard-copy as well as on video-tape.

These thermograms would address mainly three areas of concern: thermal bridging, condensation on structural members and moisture movement.

HUMBOLDT

The thermographic survey shows a considerable weakness at the roof line where air exfiltration is evident. As can be expected some air exfiltration is shown at the door locations. There also seems to be a moderate amount of thermal bridging.

Icing on the metal roof was noted and was caused by the mechanical system discharging heat directly to the underside of roof. This was corrected after discussion with the operating staff.

In conclusion the thermal faults are not significant and can be expected with this type of structure. Heat loss would not be much greater than predicted by design.

TISDALE

The thermographic survey of this complex shows a number of anomalies and later in this report further detailed commentary will be made respecting these anomalies. In general however, it is noted that the exterior wall evidences significant thermal bridging as well as condensation in the insulation. See Appendix E.

ARENA

Humboldt arena is approximately 3546 m^2 with the change rooms on the same level as the ice surface. This level is approximately 2.4 m below grade.

The Tisdale arena is approximately 3063 m^2, the difference in area primarily is spectator viewing The dressing rooms in this facility are lower than the ice surface, thus causing a migration of cold air to these areas. (see building section)

Both arenas have artificial ice over a concrete floorslab over 3.5 RSI insulation.

Roof insulation for other areas in both cases is RSI 1.7. Wall insulation in Tisdale is loose fill with 20 cm concrete block.

The exterior walls of the Tisdale Arena evidence condensation and thermal bridging - the condensation will eventually lead to a deterioration of the concrete block wall and the insulating value of the loose fill insulation. Some cracking in the east wall was also noticed.

One must question the "2 storey" glass enclosed exit stair located on the north elevation of the hockey rink (photo 44 - Thermal Focus) in view of the stated philosophy of utilizing glazing to capture radiant heat. It would seem that this architectural feature runs counter to the stated goals by the designers. This anomaly however is not serious since a door in this corridor effectively creates a vestibule (air lock).

The major energy conflict architecturally in this area is between the heated changerooms and the ice surface which is at a higher elevation. Since no airlocks exist between these two areas, there would be a constant requirement for heating in the change rooms and conversely the heat from the change areas would enter the arena and thus require additional cooling of the ice.

LOBBY/CONVENTION AREAS

Humboldt complex has a large lobby complete with vestibules, as well as various ancillary spaces including meeting rooms and large convention/dining rooom. with a total area of 1860 sq. m.

The Tisdale complex has a large public gathering space in the lobby and ancillary meeting rooms including a day care facility. The total area is 1950 m^2.

The differences between these two areas are mainly in the juxtaposition of the various elements. In Humboldt all areas are on groundlevel with a definite separation between arena lobby and community centre spaces; in Tisdale the meeting rooms are at a mezzanine level, with a two level public lobby. There are a number of anomalies in this area at Tisdale.

The lower exterior wall in Tisdale is scalloped, which results not only in a space loss but also in the creation of small whirlwinds (visually observed) which have a cooling effect. The recesses of the scallops are mainly in shade during the winter and thus do not receive intended solar gain.

The upper level is flush without sun shading thus creating a significant heat load in summer. The columns (hollow steel tubes) are in an exterior mode in the groundfloor and become interior units on the second floor thus creating a cooling fin (see photos 3 and 4).

The window wall on the second floor to the northwest is installed backwards. This causes condensation and general deterioration of the outside wall (photo 3). A further contributing factor is the presence of many holes in the vapour barrier. The public lobby has no vestibule and thus is subject to a great deal of heat loss and wind penetration.

The skylights (Kalwall) are installed in a flat horizontal plane and evidence considerable internal condensation.

CURLING RINK

Humboldt curling rink is approximately 1495 m^2 with the confectionary area shared with the public space for the arena. The change rooms are on a lower level and the bar/viewing area at the upper level.

The Tisdale curling rink is approximately 1390 m^2 with the change area on ground floor and bar/lounge on second floor.

The construction of both facilities is similar with the exception that Humboldt is depressed 1.1 m below grade.

In Tisdale there is a higher incidence of thermal bridging, condensation and air infiltration than in the Humboldt rink. Some areas indeed seem to have little or no wall insulation.

ELECTRICAL

OBJECTIVES

1) Electrical

Overall electrical power consumption as determined by meter readings for the monitoring period of January 24, 1983 thru January 31, 1984.

Tisdale Recplex	1,260,480 kwhr/12 mo.
Humboldt Uniplex	1,128,240 kwhr/12 mo.

Overall electrical power consumption for specific areas of the individual sites:

Tisdale Recplex	- curling rink	214,282 kwhr/12 mo.	- (17%)
	- arena	655,450 " "	- (52%)
	- other areas	390,748 " "	- (31%)
Humboldt Uniplex	- curling rink	225,648 kwhr/12 mo.	- (20%)
	- arena	564,120 " "	- (50%)
	- other areas	338,472 " "	- (30%)

It should be noted that the curling rink portion of the Tisdale Recplex does not include any support areas of the curling rink (ie, upper and lower lounge, washroom facilities, etc.) whereas the curling rink portion of the Humboldt Uniplex does in fact include these support facilities.

Comparative power consumption for the two complexes:

Tisdale Recplex	1,296,480 kwhr/12 mo. 6633 sq. m. 190 kwhr/sq. m./12 mo. 15.8 kwhr/sq. m./mo.

Humboldt Uniplex	1,128,240 kwhr/12 mo. 9383 sq. m. 120 kwhr/sq. m./12 mo. 10 kwhr/sq. m. /mo.

METHODOLOGY

1) Monitoring Equipment:

The electrical power consumption monitoring is accomplished with elapsed time indicators (ETI) and kilowatt-hour meters (kwhr) for the identified loads at each location.

The elapsed time indicators are generally used on loads exhibiting a constant load (ie, fans, lighting, etc.). The kilowatt hour meters are generally used to monitor varying type loads (ie, pumps, compressors, etc).

2) Process:

Electrical analysis: The designated personnel at each complex were assigned to record the readings as generated by the ETI's or kwhr meters and entered onto the log tables provided at the beginning of the monitoring period. It was attempted to have these readings taken once a week on the same day of the week. Readings commenced on January 24, 1983 and for the purpose of this report read up to January 31, 1984.

Specific Areas:

1) Arena: Tisdale Recplex - the ice surface is illuminated to a level of 55 footcandles maintained utilizing 21 1000 watt Metal Halide High Bay Luminaires controlled by dimming modules. Spectator seating and walkways in the arena are illuminated using 2 lamp 4 ft High Output (60 watts per lamp) Industrial fluorescent and 2 lamp 8 ft High

Output (112 watts per lamp) Industrial fluorescent fixtures controlled by low voltage switching. Dressing rooms are lit using 2 lamp 4 ft. High Output fluorescent fixtures.

Humboldt Uniplex - the ice surface is illuminated to a maximum of 45 footcandles utilizing 28-400 watt High Pressure Sodium High Bay Luminarires plus 26 - 2 lamp 8 ft High Output (112 watts per lamp) Industrial fluorescent fixtures controlled by low voltage switching for different light levels. Spectator seating and walkways are illuminated using 2 lamp 4 ft (40 watts per lamp) Industrial fluorescent fixtures. Dressing rooms are lit using 2 lamp 4 ft (40 watts per lamp) fluorescent fixtures.

2) Curling Rink: - Tisdale Recplex - the 6 sheet curling rink has the ice surface illuminated using 17 - 1000 watt Metal Halide High Bay Luminaires controlled by a dimming module with 40 footcandles on the house and 25 footcandles on remainder. The support areas (ie, lounges, washrooms, etc.) are lit using 2 lamp 40 watt fluorescent fixtures.

Humboldt Uniplex - the 6 sheet curling rink has the ice surface illuminted using 93 - 2 lamp 8 ft High Output (112 watts per lamp) Industrial fluorescent fixtures controlled by low voltage switching for a footcandle level of 50 footcandles on the house and 35 footcandles on remainder. The support areas are lit using 2 lamp 40 watt fluorescent fixtures.

3) Lobby/Convention: - Tisdale Recplex - the lower portion of the lobby is lit using 2 lamp 40 watt fluorescent fixtures. Washrooms and service rooms likewise have 2 lamp 40 watt fluorescent fixtures. The upper portion of the lobby is lit using 400 watt mercury vapour fixtures, with 175 watt mercury vapour fixtures used around the upper walkway. The remainder of the areas have 2 lamp 40 watt fluorescent fixtures with the exception of the office areas which have

4 lamp 40 watt fluorescent fixtures. The lobby lighting is controlled by low voltage switching, the remainder by localized line voltage switching.

Humboldt Uniplex - the lobby is illuminated using 29 - 2 lamp 4 ft High Output (60 watts per lamp) fluorescent fixtures controlled by low voltage switching. The remainder of lobby area and offices are lit using 2 lamp 40 watt fluorescent fixtures. The convention/hall portion of the complex is illuminated using fluorescent fixtures: main hall - 24 - 8 lamp, 40 watt each, 4 ft x 4 ft fluorescent fixtures; meeting rooms 4 lamp, 40 watt, 2 ft x 4 ft fluorescent fixtures; remainder is serviced using fluorescent fixtures.

CONCLUSIONS

a) The electrical power consumption (KW and KVA demand) for the facilities is set out in Table 1.

In reference to energy consumption (kwhr) and electrical demand (KVA) of the Tisdale Complex as compared to Humboldt, the following is noted:

i) total connected kilowatts of mechanical loads (approx)-

Tisdale - 410 kw (550 HP)
Humboldt - 221 kw (300 HP)

ii) total connected kilowatts of lighting, electrical heat and misc. power distribution (approx) -

Tisdale - 175 kw (235 HP)
Humboldt - 173 kw (232 HP)

iii) total connected load of all equipment and lighting, etc. (approx) -

Tisdale - 585 kw (785 HP)
Humboldt - 394 kw (532 HP)

b) Assessment of value of special energy efficient features in Tisdale:

The energy consumption for the ice surface lighting is based on the 12 month period from January 24, 1983 thru January 31 1984. The number of hours that both complexes were in use on a per week basis is relatively the same. Costs were calculated at $.0236 per kwhr and $8.43 per KVA per month. (Costs include E & H tax and 5% municipal surcharge).

ICE SURFACE LIGHTING

TISDALE

ARENA	22.785 kw - fixture wattage total 73,164 kwhr - energy consumption of ice surface lighting.
CURLING RINK	18.445 kw - fixture wattage total 36,324 kwhr - energy consumption of ice surface lighting.

HUMBOLDT

ARENA 19.820 kw - fixture wattage total
58,667 kwhr - energy consumption of ice surface lighting.

CURLING RINK 22.320 kw - fixture wattage total
46,872 kwhr - energy consumption of ice surface lighting.

i) Percentage of total connected load (kw) in Tisdale for the ice surface lighting (arena and curling rink):

Tisdale - arena 22.785 kw
curling rink 18.445 kw
41.230 kw

$$\frac{41.23\text{ kw}}{585\text{ kw}} \times 100 = 7\% \text{ of total connected load}$$

Humboldt - arena 19.82 kw
curling rink 22.32 kw
42.14 kw

$$\frac{42.14\text{ kw}}{394\text{ kw}} \times 100 = 10.7\% \text{ of total connected load}$$

ii) Percentage of energy consumption for the above-mentioned period for the Tisdale arena and curling rink lighting:

$$\text{Tisdale} - \frac{73{,}164 + 36{,}324\text{ kwhr}}{1{,}260{,}480\text{ kwhr}} \times 100 = 8.7\%$$

$$\text{Humboldt} - \frac{58{,}667 + 46{,}872\text{ kwhr}}{1{,}128{,}240\text{ kwhr}} \times 100 = 9.4\%$$

iii) Electrical costs for the arena and curling rink lighting:

Tisdale - arena:

$$\frac{73,164 \text{ kwhr} \times .0236/\text{kwhr}}{37 \text{ weeks}} = \$46/\text{week} = \$202/\text{month}$$

* 17.54 kw x $8.43/kw/mo. = $148/mo.

Operation of arena lighting approx. 8 mo/yr. = $2800/yr.

- curling rink:

$$\frac{36,324 \text{ kwhr} \times .0236/\text{kwhr}}{25 \text{ weeks}} = \$148/\text{mo.}$$

*9.22 kw x $8.43/kw/mo. = $78/mo.

Operation of curling rink lighting approx. 6 mo/yr. = $1356/yr.

Total electrical operation cost of lighting;
$2800 + 1356 = $4156/yr.

* - based on elapsed time indicator readings, the average kw demand for arena lighting was .77 x 22.785 kw and curling rink lighting was .5 x 18.445 kw.

Humboldt - arena:

$$\frac{58667 \text{ kwhr} \times \$.0236/\text{kwhr}}{37 \text{ weeks}} = \$37/\text{week} = \$162/\text{mo.}$$

19.82 kw x $8.43/kw/mo. = $167/mo.

Operation of arena lighting approx. 8 mo/yr. = $2632/yr.

- curling rink:

$$\frac{46,872 \text{ kwhr} \times \$.0236/\text{kwhr}}{25 \text{ weeks}} = \$44/\text{week} = \$190/\text{mo.}$$

22.32 kw x $.0236/kwhr/mo. = $188/mo.

Operation of curling rink lighting approx. 6 mo/yr. = $2268/yr.

Total electrical operation cost of lighting ;
$2632 + 2268 = $4900/yr.

iv) Payback:
$12,000 cost over and above a standard lighting control system for a dimming control system.

$$\frac{\$22,000 \text{ (dimming)} - \$10,000 \text{ (standard)}}{\$4900 \text{ (standard)} - \$4156 \text{ (dimming)}} = 16.1 \text{ years}$$

v) Percentage difference in energy consumption between the two complexes for lighting in the arena and curling rink:

arena:

$$\frac{73,164 \text{ kwhr (Tisdale)} - 58,667 \text{ kwhr (Humboldt)}}{73,164} \times 100$$

= 19.8% more in Tisdale

curling rink:

$$\frac{46,872 \text{ kwhr(Humboldt)} - 36,324 \text{ kwhr (Tisdale)}}{46,872} \times 100$$

= 22.5% less in Tisdale

c) Actual versus Computer Predictions:

	ELEC. KWH		ELEC. KVA DEMAND	
MONTH	ACTUAL	PREDICTED	ACTUAL	PREDICTED
Feb.(83)	116160	63790	460.8	172
Mar.	159360	70806	480.0	173
Apr.	62400	69884	384.0	176
May	17280	75425	96.0	186
June	21120	73517	115.2	186
July		76181		187
Aug.	14400	77036	76.8	190
Sept.	15360	70638	76.8	179
Oct.	109440	71492	384.0	174
Nov.	144000	68576	441.6	173
Dec.	113280	70535	422.4	171
Jan.(84)	156000	70489	470.4	169

ENERGY CONSUMPTION (Kilowatt Hours)

AREAS		Feb(83)	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan 84	Total
Tisdale Arena & Curling Refrigeration	RC-1 -	37879	17203	0	0	0	0	0	10112	1436	200	250	90	67170
	RC-2 -	15228	9331	0	0	0	0	0	7058	38119	44687	30282	14758	159463
	BP-1 Arena	12375	12094	938	0	0	0	0	0	938	0	0	0	26345
	BP-2 Curl	2813	3938	281	0	0	0	0	0	1688	2250	2813	3094	16867
	EC-1	3375	3375	0	0	0	0	0	0	4500	4500	5063	4500	25313
Humboldt Arena & Curling Refrigeration	C-17) Arena	17439	18258	9337	0	0	0	27587	16536	39060	20825	21603	21000	191645
	C-2) Arena	17165	17082	7480	0	0	0	22408	21351	31071	15780	16220	16000	164557
	SH) Arena	1050	1050	525	0	0	0	375	750	1500	938	975	975	8138
	C3) Curling	12385	11628	298	0	0	0	0	0	6756	10024	11083	10500	62672
	FP) Curling	3920	4480	3640	0	0	0	0	0	4760	2520	3640	3080	26040
Tisdale Curling Heat	RT-1	788	1283	388	0	0	0	0	0	0	0	563	450	3422
	RT-2	563	450	169	0	0	0	0	0	56	450	675	675	3038
Humboldt Curling Heat	VU1.1	196	225	84	0	0	0	0	0	140	56	112	168	981
	VU1.2	225	150	75	0	0	0	0	0	75	150	113	150	938
	VU1.3	38	113	0	0	0	0	0	0	188	75	150	150	714
Tisdale Arena Heat	RT-3	726	169	0	0	0	0	0	0	0	169	844	675	2583
	RT-4	844	506	85	0	0	0	0	0	85	337	675	337	2869
	RT-5	506	169	0	0	0	0	0	0	85	169	169	506	1604
Humboldt Arena Heat	VU1.5	0	1120	840	0	0	0	0	0	560	560	1680	2240	7000
	VU1.6	280	3920	3920	0	0	0	0	0	840	1680	2240	3920	16800
Tisdale Lobby	HP-1	9613	7598	5129	0	0	0	0	10234	0	4950	3037	3544	44105

	FEBRUARY 83		MARCH		APRIL		MAY		JUNE		JULY	
	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt
Electrical Energy Consumption (KWH)*	116160	141480	159360	124200	62400	58320	17280	27360	21120	20880	—	23040
Electrical Demand (KVA)*	460.8	345.6	480.0	334.8	384.0	282.0	96.0	100.8	115.2	108.0	—	144.0

	AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		JANUARY 84	
	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt	Tisdale	Humboldt
Electrical Energy Consumption (KWH)*	14400	82080	15360	94680	109440	102960	144000	155520	113280	119880	156000	159120
Electrical Demand (KVA)*	76.8	223.2	76.8	244.8	384.0	324.0	441.6	352.8	422.4	374.4	470.4	360.0

CONSUMPTION AND DEMAND AS RECORDED FROM SPC MONTHLY BILLING STATEMENTS

MECHANICAL

TISDALE / HUMBOLDT ENERGY STUDY

****

The following report regarding Energy Consumption at the Tisdale Recreation Centre and the Humboldt Uniplex is the result of a one year study conducted simultaneously at both centers.

The electrical and natural gas consumption in both complexes was monitored on a weekly basis commencing in January, 1983, and was recorded for a 12 month period.

The original plans for the Energy Study called for separate gas and electrical meters to be installed on all equipment that consumed energy at both the Tisdale and Humboldt Complexes. However, due to budget restraints the Hombo1dt Complex was not fitted with additional gas meters to record the actual gas used by each piece of mechanical equipment. This change has resulted in several approximations being used regarding the distribution of energy consumption within the Humboldt Complex.

In addition to the energy studies being conducted at Tisdale and Humboldt, the energy being used in several other Saskatchewan Recreation Complexes has been recorded and is being included in this report for comparison purposes.

OBJECTIVES

1) Mechanical

During the design and construction of the Tisdale project several items were introduced into the mechanical and electrical systems in an effort to conserve energy used in the operation of the complex.

In order to monitor and record the energy consumption and distribution within the complex several natural gas and electrical satellite meters were installed in addition to the main Saskatchewan Power gas and electrical consumption meters.

In an effort to compare the energy consumption being recorded within the Tisdale Complex to other buildings with similar usage the new Humboldt Uniplex was choosen.

Although the Humboldt Uniplex is approximately 40% larger in floor area than the Tisdale Complex it was felt that it would be an excellent comparative building.

Both buildings are located on approximately the same latitude and at the same altitude and are separated by only 60 miles. Due to these factors both complexes experience similar weather conditions on a daily basis.

Both complexes are made up of a Curling Rink, a Skating Rink and a Community Centre so they experience similar usage.

And finally, the Humboldt Complex contains basic electrical and mechanical systems that are standard in the industry without including any elaborate methods of energy conservation.

The systems used are typical to those used in several other Community Centers throughout the province.

To sum up the mechanical objectives of this Energy Study they would be as follows:

(a) Accurately monitor and record the natural gas consumption by each piece of equipment involved in the mechanical system serving the Tisdale Complex.

(b) Monitor and record energy consumption in such a manner that the mechanical systems intended to conserve energy could be studied and also compared to standard mechanical systems used in other buildings.

(c) To compare the energy consumption and more importantly the operating costs of the Tisdale Complex to a similar complex during the same period of time.

In this case the Humboldt Uniplex was chosen for comparative purposes.

METHODOLOGY

TISDALE RECREATION CENTRE

(A) Ice Arena

The Ice Arena (not including changing rooms, washrooms, etc.) is heated and ventilated by means of 3 roof top natural gas fired heating units (RT-3, 4, & 5) and 3 return air/exhaust air fans (EX 3, 4, & 5).

The natural gas consumed by the roof top heating units was recorded by the use of gas meters mounted at each unit.

The heating and ventilation system within this space is not tied into the remainder of the building. No method of heat reclaim or usage of waste heat from the Ice Plant or remainder of the building has been employed in this area.

(B) Curling Arena

The area of the building used for curling (not including waiting or spectator area) is heated and ventilated by means of 2 roof top natural gas fired heating units (RT-1 & RT-2) and 2 exhaust fans (EX-1 & EX-2).

The natural gas consumed by the roof top heating units was recorded by the use of gas meters mounted at each unit.

The heating and ventilation system within this space is not tied into the remainder of the building. No method of heat reclaim or usage of waste heat from the Ice Plant or remainder of the building has been employed in this area.

(C) Shooting Range

The Shooting Range is located at a lower level within the building and is heated and ventilated by means of natural gas roof top make-up air unit (MA-2) and an exhaust fan (EX-9).

The natural gas used by this system was recorded by the use of a gas meter located on the roof top unit.

This ventilation and heating system is not tied into the remainder of the building and is similar to the Ice Arena and Curling Rink, in that, heat reclaim or waste heat from the remainder of the building was not used to heat this area of the complex.

(D) Concourse Area

The two storey Concourse Area is ventilated and partially heated by means of a natural gas roof top unit (RT-6). The gas consumed by this unit was recorded by the use of a gas meter mounted at the unit.

This unit supplies heated outside air to the Concourse Area in order to replace the air being exhausted by washroom exhaust fans EX-6 and EX-7.

This system does not include any heat recovery or the utilization of waste heat from the remainder of the building.

(E) Locker and Change Rooms

The Locker and Change Rooms that serve the Ice Arena are ventilated and partially heated by means of a roof top make-up air unit (MA-1).

The natural gas being consumed by this unit is recorded by a meter mounted on the unit.

The air being supplied to the Locker and Change Room is being exhausted by exhaust fan EX-8 located on the roof of the building.

This system is similar to the Concourse Area, in that, the ventilation and exhaust system is not tied into the remainder of the complex and heat recovery or utilization of waste heat from the remainder of the building was not employed.

(F) Hot Water Boiler System

The natural gas consumed by the two hot water boilers was recorded by gas meters located on the boilers.

The boilers produce hot water for several different functions as follows:

(a) Hot water from the boiler system is used to heat the Main Floor Lobby Area and Main Entrance and Vestibule. Wall-fin radiation was used to heat the perimeter of the Lobby Area and fan/coil units were used to heat the Main Entrance Vestibule. Hot water is pumped through this system by the main heating pumps HW-1 and HW-2.

(b) Hot water from the boiler system is used to supply hot water for the Zamboni Ice Grooming Equipment.

A storage tank complete with a heat exchanger (TX-1) is used for this purpose. The main heating pumps HW-1 and HW-2 provide the required circulation through the tank heat exchanger and boiler system.

(c) Hot water from the boiler system is used to heat the room containing the Ice Melting Pit and also is used to actually melt the ice as it is placed in the pit.

The heat from the boiler water is transferred to the pit by means of a water to glycol heat exchanger HX-4.

The water is circulated through the heat exchanger and through the room unit heater by means of the main heating pumps HW-1 and HW-2. The glycol is pumped through the melting pit coil by pump HW-9.

It should be noted that boiler functions (a), (b), and (c) are not part of any heat recovery or heat reclaim system.

(d) The final function of the hot water boilers is to supply heating to the "Water Source Heat Pump" Loop System.

The heat from the boiler loop is transferred to the heat pump loop by means of a water to water shell and tube heat exchanger (HX-1). Once again the required hot water circulation through the heat exchanger tubes is supplied by the main heating pumps HW-1 and HW-2.

It should be noted that other than recording "run time" of the various pumps involved in the complete boiler system the mechanical budget did not allow the installation of any equipment to isolate or record the boiler functions (a, b, c, and d) separately.

(G) Hot Water Heater #1

The gas fired hot water heater (HWH-1) was fitted with a gas meter to record the energy used by this system.

This water heater supplies domestic hot water for the entire complex including washrooms, shower and kitchen equipment.

The water entering the domestic heating system is preheated by means of a shell and tube, water to water heat exchanger (HX-2) and a storage tank (ST-1).

The energy used to preheat the water entering the domestic hot water system is supplied by the heat pump system.

We were not able to monitor the amount of energy transferred to the preheated domestic water as part of this Energy Study.

(H) Hot Water Heater #2

The hot water required for flooding the ice in both the Skating Rink and the Curling Area and the hot water used for pebbling and fogging the Curling Area ice is provided by HWH-2.

This is an electric water heater and energy consumed was recorded as part of the electrical study.

The water entering this system is not part of a preheat system.

(I) Heat Pump System

The water source heat pump system was used as the main method of Energy Conservation with respect to the building mechanical system.

By means of a number of water source heat pumps and some shell and tube heat exchangers the waste heat produced by the condenser serving the Artificial Ice Plant has been used for the following functions:

(a) Domestic Water Preheat

As outlined in the section of this report regarding HWH-1 the energy in the heat pump loop is being used to preheat the domestic hot water system.

(b) Curling and Skating Rink Slab Heating Grid

Both the Skating and Curling Rinks are complete with a heating pipe grid installed below the cooling pipe grid used to produce artificial ice. The heating pipe grid is used to prevent freezing conditions from entering the earth below the ice surface slab. The energy required to produce this function is supplied by the heat pump loop. Energy from the loop is transferred through a shell and tube, water to glycol heat exchanger (HX-3) to the glycol contained in the heating grid system. The glycol is circulated by pumps HW-3 and HW-4.

(c) Heat Pump System

The heat pump system is made up of 15 water source heat pumps serving the Concourse Area, the Mezzanine, the Locker and Change Room Area, the Curling Spectator Area, the Ice Plant Room and the Boiler Room with heating and cooling.

If the waste heat from the Ice Plant is in excess of that required by functions A, B, and C the surplus heat is discharged to the outdoors by means of an "Evaporative Cooling Tower" (EC-1).

If the waste heat from the Ice Plant is not sufficient for the needs of functions A, B, and C the gas fired hot water boilers make-up the short fall. The energy is transferred from the boiler loop to the heat pump loop by means of a heat exchanger (HX-1).

During the summer cooling season the surplus energy being transferred to the heat pump loop by the heat pumps and Ice Plant is similarily discharged to the outdoors by means of the "Evaporative Cooling Tower".

(J) Ice Plant Room

In addition to the heat pump serving the Ice Plant Room this area is also complete with an air to air heat exchanger. The energy contained in the exhaust air from this space is being transferred to the outside air being used as make-up.

The monitoring system as installed did not include any method of recording the energy saved by this system.

(K) Standby Power and Kitchen Equipment

The complex is complete with a natural gas-fired standby power generator. Also some of the kitchen equipment that serves the complex is gas-fired.

The natural gas used by both the standby generator and the kitchen equipment was not separately metered but was monitored only by the main gas meter serving the Recreation Complex.

METHODOLOGY

HUMBOLDT UNIPLEX

(A) Ice Arena

The Ice Arena (not including changing rooms, washrooms, etc.) is heated and ventilated by means of 2 natural gas indirect fired ventilation units (VU-1.5 and VU-1.6), 4 supply air fans (V.F.-2.1, 2.2, 2.3 and 2.4) and 4 roof top exhaust fans (EF-3, 4, 5, and 6).

The vent units are complete with a mixed air box and automatically controlled dampers. Outside and return air can be mixed to control mixed air temperature and/or humidity within the space.

The four (4) supply air fans and the four (4) exhaust air fans simply bring in raw outside air and exhaust the space to the outdoors with no method of heat reclaim involved.

Several antistratification fans are installed in the arena over the ice area.

The natural gas consumed by the two (2) vent units was not metered. However, both units were fitted with electric "run-time" meters. The natural gas consumed by these two units is controlled by modulating gas valves so "run-time" and gas consumption do not have any direct correlation.

(B) Curling Arena

The Curling Ice Area (not including the waiting or spectator area) is heated and ventilated by means of two (2) roof top natural gas indirect fired ventilation units (VU-1.2 and VU-1.3) and one exhaust fan (E.F.-1.6).

The roof top vent units are complete with mixing boxes to allow the units to bring in and mix up to 100% outside air with return air from the space.

These roof top units were fitted with electric "run-time" meters. However, due to the fact the natural gas valves are modulating, the "run-time" as recorded and the natural gas consumption are not directly related.

(C) Main Lobby

This heating system is complete with mixing dampers and fresh air intake to ventilate and provide fresh air to the area being served.

The offices and rooms adjacent to the main lobby and entrance are heated by means of electric baseboard radiation.

The vent unit (VU-1.4) was fitted with an electric "runmeter" to monitor energy consumption. However, the electric radiation in this area is simply bulk metered.

(D) Locker and Change Rooms

The locker rooms, dressing rooms, and washroom rooms located on both the north and south sides of the Ice Arena/ Lower Level are heated by means of hot water radiation, convectors and unit heaters.

This area is ventilated and exhausted by means of separate supply air and exhaust air "fan and duct" systems.

Fresh air is provided by means of supply air fans (S.F.-1 and S.F.-2). These fans bring in outside air which is then heated by means of hot water coils and then ducted to the areas involved.

Exhaust Fans (E.F.-1 and E.F.-2) exhaust the areas directly to the outside.

The natural gas fired boilers (Boilers #1, #2, and #3) that provide the hot water for the heating and ventilation of this area as well as the domestic hot water for washroom and shower use are located in the mechanical room/upper level adjacent to the north side of the Arena area.

Each boiler was fitted with a "run-time" meter.

(E) Spectator and Waiting Rooms

The two-level spectator and waiting rooms that serve the Curling Rink are heated and ventilated by means of a natural gas indirect fired roof top unit (VU-1.1).

This unit supplies heating and ventilation to the 2nd Floor, the Main Floor, and the Basement of this area. The unit is complete with a mixing box, dampers, and controls to bring in up to 100% fresh air.

This unit is complete with a 2-stage gas valve and an electrical meter to record the "run-time".

Once again, because of the gas valve used, the "run-time" of the unit does not relate to the gas comsumption.

Some perimeter rooms that make up this area as well as some stairwells are heated by means of hot water radiation and unit heaters.

These heating units are supplied from the boilers #1, #2, and #3, located in the mechanical room north of the Ice Arena.

(F) Kitchen Area

The Kitchen Area serving the Curling and Skating Rinks is ventilated and exhausted by means of make-up air unit (M.A.-1.1) and an exhaust fan. The roof top make-up air unit was also fitted with a meter to record "run-time".

(G) Community Centre

The Community Centre consists of the Main Hall, a Youth Centre, Washrooms, a Lobby, a Vestibule, and a large Meeting Room that can be subdivided into three (3) smaller rooms.

The Main Hall is heated by a natural gas fired furnace (F-2.2) and is ventilated by a large supply air fan system (S.F.-2.1).

The furnace "run-time" was monitored during the Energy Study.

The ventilation system is not complete with a heating source, fresh air is simply drawn into the system and mixed with return air from the space to provide the required temperature control and ventilation needs of the space.

The Youth Centre is heated and ventilated by a natural gas fired furnace (F-2.3). This heating system is complete with a fresh air intake duct, mixing dampers with a mixed air temperature controller and a space thermostat. The "run-time" of this unit was also monitored.

Both furnaces (F-2.2 and F-2.3) and the main ventilation system (S.F.-2.1) are located in the upper level mechanical room adjacent to the Ice Arena.

The Meeting Rooms located at the northeast end of the Community Centre are heated by a single gas-fired furnace (F-2.1).

This furnace is located in a small separate mechanical room located in the northeast corner of the complex and is not complete with a fresh air intake system.

The required ventilation for the meeting rooms is provided by a single supply air vent system (S.F.-2.1). This unit is complete with a fresh air intake, return air system, relief air and air filter system, but has no direct heat source.

This vent unit is located in the same room as furnace (F-2.1).

The Main Entrance, Lobby, Vestibule, and Washrooms in the Community Centre Area are heated by means of electric force flows and radiation. The Youth Centre is also complete with some supplementary electric heat.

(H) Ice Plant Room

The Ice Plant Room is located at the southeast corner of the Ice Arena.

The refrigeration equipment for both the Ice Arena and the Curling Rink are located here.

The air cooled condensers that make up part of the ice making equipment are located at the south side of the Ice Plant Room.

In addition, a natural gas fired boiler (B-4.4) is located in this area. This boiler provides the hot water required for ice flooding and ice maintanance for both the Ice Arena and the Curling Rink. This boiler also provides heat for the Ice Plant Room.

One unique aspect of the ice flooding system is that this system includes 2 x 56,781 liter underground water storage tanks.

Rainwater from the building roof is directed to the tanks and stored for winter use. During winter operations the water in the tanks is heated by Boiler (B-4.4) and then pumped out to the ice surface as required.

In addition to having soft rainwater on hand for ice making, the large storage tanks allow for a relatively small boiler to be used for heating the water. With 113,562 liters of 82.2°C water on tap the heating system required recovery rate was reduced by a very significant amount.

(I) Standby Power and Kitchen Equipment

The complex is complete with a natural gas fired standby power generator. Also some of the kitchen equipment that serves both the Skating and Curling Rink and the Community Centre is natural gas fired.

The natural gas used by both the standby generator and kitchen equipment was monitored only by the main gas meter serving the entire complex.

DISCUSSION

Climate Conditions / Tisdale and Humboldt

To add to the credibility of the energy consumption comparison between the Tisdale and Humboldt Complexes, we have included as part of this report the daily climate data for the energy monitoring period as provided by Environment Canada.

The Tisdale weather data was recorded at nearby Melfort and the Humboldt data was recorded at Humboldt.

The data involved is contained in Appendix "A" of this report. However, we feel that the following information should be "highlighted" at this time.

Climatic Date Environment Canada	Humboldt		Tisdale (Melfort)	
Time Period	Degree Days	Mean Temp.	Degree Days	Mean Temp.
January/83	989.1	-13.9°C	995.2	-14.1°C
February/83	858.0	-12.9°C	879.0	-13.4°C
March/83	808.7	- 8.2°C	831.1	- 8.8°C
April/83	504.8	1.2°C	540.8	0.0°C
May/83	missing	8.0°C	missing	7.8°C
June/83	missing	* 14.9°C	missing	15.5°C
July/83	36.5	17.9°C	26.2	18.3°C
August/83	16.7	19.6°C	12.1	19.1°C
September/83	259.4	9.5°C	248.9	9.8°C
October/83	missing	* 4.6°C	missing	5.1°C
November/83	missing	* -1.1°C	missing	3.4°C
December/83	1291.0	*-23.6°C	1278.4	-23.2°C
January/84	missing	-13.9°C	missing	-14.2°C

* estimated

Total Degree Days for One Year Period	4764.2		4811.7	
Average Mean Temperature		0.16°C		0.41°C

With the degree days at both locations being within 50 and the average mean temperature being within approximately 0.25°C, we feel that the differences in weather conditions between Tisdale and Humboldt had little, if any, effect on the operating costs of the two complexes.

Energy Consumption

From January 25, 1983 to January 31, 1984 energy consumption was monitored and recorded at the Recreation Centres at both Tisdale and Humboldt.

At Tisdale the Energy Consumption was monitored by means of the primary Saskatchewan Power gas and electrical meters, secondary gas meters, secondary power meters, and some "run-time" meters.

At Humboldt secondary gas meters were not installed so Energy Consumption was monitored by means of the primary natural gas meter, the primary electrical meter, several secondary electrical meters and several "run-time" meters.

As stated previously in this report, the "run-time" meters could not be used to establish natural gas consumption of various pieces of mechanical equipment due to the fact that modulating or 2-stage gas valves were used to fire the equipment.

In order to arrive at an approximation we used the total "run-time" of the equipment in conjunction with the maximum gas input and prorated the consumption to approximate the total natural gas consumption as monitored by the primary gas meter.

The natural gas and electrical energy used by each piece of mechanical equipment converted to the total kWh consumed by each complex was recorded on a weekly basis and is contained in Appendix "C" of this report.

The electrical energy included in this Appendix does not include energy consumed by lighting.

The natural gas and/or electrical energy used by each piece of mechanical equipment was recorded on a weekly basis. The natural gas consumed was recorded in "m^3 x 100", we then converted the "m^{3}x 100^3 to "KWH" so that the entire consumption, gas and electric, is recorded as "KWH".

In an effort to compare the energy consumed by various areas of the two complexes we attempted to group the mechanical equipment that serves the areas in question.

We separated both complexes into 3 areas: Arena; Curling Rink; and the Remainder of the Complex including Washrooms, Locker Rooms, Community Centres, etc.

The results of this undertaking are contained in Appendix "C" of this report.

In order to compare "Energy Consumption" and more important "Energy Costs" to operate the Tisdale and Humboldt Complexes, we have extracted the following results from the information contained in Appendixes "B" and "C".

(1) Energy Consumption / gas and electric, site measured / KWH

Tisdale:

Time Period / 1983

Area	Jan. 25 to Feb. 27	Feb. 28 to Mar. 27	Mar. 28 to Apr. 24	Apr. 24 to May 29	May 30 to Sept. 11	Sept. 12 to Oct. 16	Oct. 17 to Dec. 11	Dec. 12 to Jan. 30
"GAS"								
Arena	192,462	37,703	3,194	0	1,144	3,429	53,032	120,159
Curling	7,823	39,957	7,796	0	206	0	56,491	131,381
Remainder	112,629	76,033	57,897	0	37,389	54,908	181,689	201,291
TOTAL GAS:	222,914	152,797	78,797	0	38,739	58,337	291,212	452,831
"ELECTRIC"								
Arena	74,894	35,123	4,940	0	13,033	22,635	89,216	43,369
Curling	26,622	14,564	767	0	22	5,704	34,407	18,510
Remainder	26,113	20,202	13,789	0	8,907	5,003	20,040	22,960
TOTAL ELECTRIC:	117,629	69,889	19,496	0	21,962	33,342	143,663	84,739

(1) Energy Consumption / gas and electric, site measured / KWH (continued)

Humboldt:

Time Period / 1983

Area	Jan. 25 to Feb. 27	Feb. 28 to Mar. 27	Mar. 28 to Apr. 24	Apr. 25 to May 29	May 30 to Sept. 11	Sept. 12 to Oct. 16	Oct. 17 to Dec. 11	Dec. 17 to Jan. 30
"GAS"								
Arena *	22,649	135,674	149,958	0	12,174	41,898	172,305	not available
Curling	133,842	91,621	22,414	0	3,033	172,350	87,079	not available
Remainder	225,029	204,297	123,312	181,491	87,271	305,701	328,014	not available
TOTAL GAS:	381,520	431,592	295,684	181,490	102,478	519,949	587,398	not available
"ELECTRIC"								
Arena	43,224	35,891	17,892	0	73,810	59,533	83,376	not available
Curling	25,613	21,033	5,214	0	300	5,356	23,357	not available
Remainder	21,471	15,290	12,793	6,433	2,021	9,626	22,943	not avaialble
TOTAL ELECTRIC:	90,308	72,214	35,899	6,433	76,131	74,515	138,676	not avaialble

(1) Energy Consumption / gas and electric, site measured / KWH (continued)

Summary / Totals:

Time Period / 1983

Area		Jan. 25 to Feb. 27	Feb. 28 to Mar. 27	Mar. 28 to Apr. 24	Apr. 25 to May 29	May 30 to Sept. 11	Sept. 12 to Oct. 16	Oct. 17 to Dec. 11	Dec. 17 to Jan. 30
"GAS & ELECTRIC"									
Tisdale	(G)	222,914	152,797	78,797	0	38,739	58,337	291,212	452,831
	(E)	117,629	69,889	19,496	0	21,962	33,342	143,663	84,739
TOTAL GAS AND ELECTRIC		340,543	222,686	88,293	0	60,701	91,679	434,875	537,570
Humboldt	(G) *	381,520	431,592	295,684	181,490	102,478	519,949	587,398	not available
	(E)	90,308	72,214	35,899	6,433	75,481	74,515	138,676	not avaialble
TOTAL GAS AND ELECTRIC		471,828	503,806	331,583	187,923	177,959	594,464	726,074	not available

(1) Energy Consumption / gas and electric, site measured / KWH (continued)

* These figures are misleading, in that, the energy used by the two main gas fired ventilation units serving the Arena was not recorded between January 25 and February 27.

(2) Energy Consumption - KWH/m³ (site measured)

	Feb.	Mar.	Apr.	May	May/ Sept.	Oct.	Oct./ Jan.	Jan.
Tisdale:								
Gas	33.56	23.00	10.36	0	** 5.83	8.78	43.87	68.18
Elec.	17.71	10.52	2.94	0	** 3.31	5.03	21.63	12.76
Humboldt:								
Gas	* 168.55	46.0	31.51	19.34	10.92	55.41	62.6	n.a.
Elec.	* 9.62	7.70	3.83	20.03	8.11	7.94	14.78	n.a.

* This figure is misleading, in that, the energy used by the two main gas fired ventilation units serving the Arena was not recorded between January 25 and February 27.

** This figure is misleading, in that, the Tisdale Complex was shut down during most of May and June, 1983.

n.a. - not available

(3) Energy Consumption - KWH/m^3 (S.P.C. meter reading)

	Feb.	Mar.	Apr.	May	May/ Sept.	Oct.	Oct./ Jan.	Jan.
Tisdale:								
Gas	29.82	27.88	12.57	3.04	* 3.75	12.48	58.10	50.7
Elec.	17.49	23.99	9.39	2.60	* 9.83	16.48	38.74	23.49

	Feb.	Mar.	Apr.	May	May/31 Sept/28	Oct.	Oct/29 Dec/27	Jan.
Humboldt:								
Gas	35.94	49.78	39.69	25.89	62.77	32.74	140.15	85.6
Elec.	9.09	15.08	13.24	6.22	33.22	15.50	41.46	23.96

* This figure is misleading, in that, the Tisdale Complex was shut down during most of May and June, 1983.

(4) Energy Costs - (total gas and electric "including lighting")

	* January	February	March	April	May	May/19 to August/10	August	September
Tisdale:								
Gas	$2,444.97	$2,037.03	$1,905.21	$ 865.48	$ 218.55	$ 170.05	$ 77.73	$ 96.28
Elec.	$6,725.07	$5,766.46	$6,787.11	$4,094.95	$1,058.19	$2,398.36	$ 987.48	$1,010.13
TOTAL:	$9,170.04	$7,797.49	$8,692.32	$4,960.43	$1,276.74	$2,568.41	$1,065.21	$1,106.41

	October	November	December	January
Gas	$ 951.42	$1,713.28	$2,678.24	$3,825.12
Elec.	$5,820.78	$7,121.97	$6,235.25	$7,648.00
TOTAL:	$6,772.20	$8,835.25	$2,671.94	$11,473.12

* Energy Costs for January, 1983 was included for both centres although monitoring did not commence until January 25, 1983.

(4) Energy Costs - (total gas and electric "including lighting") - (continued)

	* January	February	March	April	May	May/31 to August/29	August	September
Humboldt:								
Gas	$3,455.12	$4,782.61	$3,814.74	$2,490.27	$1,225.79	$1,457.72	$ 941.73	$2,290.77
Elec.	$4,230.74	$5,435.07	$5,001.45	$3,307.45	$1,300.09	$2,929.65	$3,819.05	$4,298.50
TOTAL:	$7,685.76	$10,217.68	$8,816.28	$5,797.72	$2,525.88	$4,378.37	$4,760.78	$6,589.27

	October	November	December	January
Gas	$2,459.78	$4,382.28	$6,162.17	$6,440.55
Elec.	$5,161.84	$6,644.82	$5,986.12	$6,790.49
TOTAL:	$7,621.62	$11,027.10	$12,148.29	$13,231.04

* Energy Costs for January, 1983 was included for both centres although monitoring did not commence until January 25, 1983.

(5) Energy Costs / m^3 - (total gas and electric)

	Jan.	Feb.	Mar.	Apr.	May	May/19 to Aug/10	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Tisdale:												
Gas	36.81¢	30.67¢	28.68¢	13.03¢	3.29¢	2.56¢	1.17¢	1.45¢	1.43¢	25.08¢	49.32¢	57.60¢
Elec	101.25¢	86.76¢	102.18¢	61.65¢	15.93¢	36.11¢	14.87¢	15.25¢	87.63¢	107.23¢	93.88¢	115.15¢

	Jan.	Feb.	Mar.	Apr.	May	May/31 to Aug.29	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Humboldt:												
Gas	36.82¢	50.97¢	40.66¢	26.54¢	13.06¢	15.54¢	10.04¢	24.41¢	26.22¢	46.70¢	65.67¢	68.64¢
Elec.	45.09¢	57.92¢	53.30¢	35.25¢	13.86¢	31.13¢	40.70¢	45.81¢	50.01¢	70.82¢	63.00C	72.37¢

In summary the energy costs to operate the Tisdale Recreation Complex for the monitored year (1983 - 1984) were as follows:

(a) Natural Gas .... 242.81¢/m²

(b) Electric Power (lighting included) .... 837.76¢/m²

The cost to operate the Humboldt Complex during the same period was:

(a) Natural Gas .... 425.27¢/m²

(b) Electric Power (lighting included) .... 584.34¢/m²

The following chart included the cost to operate several additional Saskatchewan Recreation Centres as compared to Tisdale and Humboldt.

(6) Energy Costs / m² - January/83 to May/83 (total gas and electric)

Location	Area - m²	Cost / m² Elec.	Cost / m² Gas	Total
Milestone	2,972.8	215.00¢	75.00¢	290.00¢
Humboldt	9,382.9	192.00¢	155.00¢	374.00¢
Maple Creek	2,071.7	260.00¢	118.00¢	378.00¢

(6) Energy Costs / m² - January/83 to May/83 (total gas and electric) - (continued)

Location	Area - m²	Cost / m² Elec.	Cost / m² Gas	Total
Assiniboia	2,664.8	274.00¢	177.00¢	391.00¢
Nipawin	3,140.0	--	--	396.00¢
Wilkie	4,309.4	467.00¢	142.00¢	409.00¢
Tisdale	6,633.0	352.00¢	109.00¢	461.00¢
Melfort	2,173.9	331.00¢	190.00¢	521.00¢
Biggar	2,787.0	363.00¢	265.00¢	628.00¢

Additional Comparison

In addition to the comparison of the amount of cost of energy used between the Tisdale and Humboldt Complexes and other Saskatchewan Recreation Centres, we will also compare the cost of energy used by Tisdale to the energy cost predicted by the Computerised Energy Study completed during the design of the project.

Computer Study

During the design stages of the Tisdale project the Engineer presented a study related to the predicted energy comsumption of the building.

As part of the study the cost of energy to operate the building was calculated for each of the first 25 years of operation.

The first 12 months of operation was predicted to cost the Owners $22,790.00 for both natural gas and electrical energy, with the following monthly breakdown:

Month	Electrical	Gas
January	$1,330.00	$1,542.00
February	$1,177.00	$ 841.00
March	$1,290.00	$ 671.00
April	$1,236.00	$ 434.00
May	$1,299.00	$ 408.00
June	$1,268.00	$ 391.00
July	$1,313.00	$ 404.00
August	$1,313.00	$ 402.00
September	$1,229.00	$ 399.00
October	$1,270.00	$ 441.00
November	$1,251.00	$ 557.00
December	$1,318.00	$1,006.00
TOTAL:	$15,294.00	$7,496.00

In actual fact, the energy cost for year 1 (1983) came to $66,389.56, approximately 292% higher than the $22,790.00 as predicted by the computer study.

CONCLUSIONS

A large amount of information has been gathered from both projects regarding the cost of operating several types of mechanical systems. However, due to the lack of accurate monitoring devices being installed in the Humboldt Complex, direct comparisons of the individual mechanical systems or spaces between Tisdale and Humboldt cannot be made.

With the information collected and recorded from the Tisdale operation several studies could be conducted comparing the actual energy consumption of a mechanical system or piece of equipment to the theoretical consumption.

Using the energy cost/unit area as a yardstick, the Tisdale Complex is not a particularly energy efficient building.

Compared to the nine (9) Recreation Centres included as part of this report the Tisdale Complex uses more energy than all but two (2) of the other facilities with six (6) Recreation Centres compared being more efficient.

When compared to Humboldt on a cost of energy consumption/unit area basis during the winter months (with the ice plants in operation) Tisdale is approximately 30% less energy efficient. When comparing Humboldt to Tisdale for the entire test period the Humboldt Complex is approximately 10% more efficient. However, we feel that this apparent change in operating efficiencies is simply due to the fact that the Tisdale Complex was shut down for approximately two (2) months during the test period.

The reason for the large difference in operating costs between Tisdale and Humboldt is difficult to pinpoint. However, the following facts should be considered:

(1) The Tisdale Complex utilizes a water source heat pump system as part of the Energy Conservation System. A future indoor swimming pool is to be used as a "heat sink" for the system. At present the system has no thermal storage capacity.

(2) The special mechanical systems used to conserve energy relate to a very small area of the total complex (just the locker rooms, the washrooms, and parts of the main lobby and mezzanine area).

(3) The control of the mechanical system is extremely complicated and if not properly maintained could waste a great deal of energy.

(4) The application of the water source heat pump system uses the waste heat being discharged from the ice making compressor and in effect changes the thermal energy to electrical energy to heat the space.

With the cost of electrical energy being approximately four (4) times that of natural gas, even with the total amount of energy being reduced by the use of the heat pump system, the total operating cost would not be reduced but would in fact increase.

(5) The building construction including infiltration and insulation is another factor that can greatly affect the energy consumption and operating costs. This item is being dealt with in the Architectural portion of this report.

(6) The amount, frequency, and type of use that the buildings are involved in can also affect energy consumption and operating costs.

The use factor is dealt with in another area of this report and the record of building use is contained in Appendix "D".

We reviewed the record of "building use" for both the Humboldt and Tisdale Recreation Centres when making the energy consumption comparison between the two centres and we found the "use" to be very similar.

(7) One factor that makes the energy cost/m³ slightly misleading when reviewing the Humboldt project is that the Community Centre section of the Humboldt Complex involves a considerable area and because of the nature of the space uses a small amount of energy.

This in turn reduces the overall energy cost/m³ of the complex.

RECOMMENDATIONS

Following our review of the results of the Energy Study we would suggest that some or all of the following items be considered in order to reduce energy consumption and/or energy costs at the Tisdale Complex:

(1) Reduce or eliminate the use of the Heat Pump System. Modify the mechanical system to utilize the existing hydronic system to heat the areas involved.

(2) Modify the cooling tower heat rejection system so that all waste heat from the Ice Plant could be used to heat the Arena and Curling Rink.

(3) Add heat reclaim to the exhaust system from the Curling Rink, the Concourse Area and the Shooting Range.

We would suggest either the "heat pipe" or "glycol loop" system of heat reclaim.

(4) Eliminating the use of the "ice melting pit". We would recommend simply dumping the surplus ice on the site north of the building.

(5) Use some waste heat from the Ice Plant to preheat the water required for the Zamboni.

(6) Eliminate the use of all electric heaters and replace with hot water units.

(7) Add heat reclaim to the flue gases from the boilers, use this heat to preheat all domestic hot water.

(8) Eliminate the use of all electric water heaters, replace with gas fired units and preheat with waste heat from the Ice Plant.

SUMMARY

SUMMARY

To recapitulate the foregoing architectural, electrical and mechanical statements, this Interim Report concludes the following for the Tisdale Complex:

Architectural:

1 The dressing rooms for the arena are at a lower elevation than the ice surface without an air barrier between, (ie doors) thus creating an heating/cooling conflict.

2 Arena and curling rink walls show condensation, thermal bridging and lack of vapour barrier. Evidence of air leakage.

3 Groundlevel "scalloped" walls result in high turbulence with deep shadowed recesses not providing any solar gain in winter months. Lack of insulation in steel framing for windows augments heatloss for glazing.

4 North-west upper window wall has no overhang and thus receives heat gain both in winter and summer.
West upper window is installed "back-to-front" and thus allows a extraordinary amount of condensation and infiltration.

5 West elevation support structure consists of 10" I.D. steel columns which are uninsulated and penetrate through soffit into interior space of second level creating a chimney effect and cold-sink.

6 Kalwall skylights over lobby/concourse add some light during daylight hours but do not contribute any solar gain in winter because of their installation in a horizontal mode. They do however collect heat gain in summer. A good deal of condensation was evidenced within the panels and air leakage was evident along the flashing perimeter.

7 Absence of vestibule on concourse level both for front entrances as well as rear subjects this space to rapid cooling during winter conditions especially when both front and rear entries are used.

8 Thermographic report and photos identify areas with poor air barriers or lack of sealants.

Electrical

1 The concourse has some 29 mercury vapour lights which appeared to be redundant to the lighting requirements of this area during nite conditions.

2 Over a 12 month period the total electical consumption was about 10% higher than predicted. The actual was 92% higher for the months of October thru March and 67% lower thru the summer months. The demand was 63% higher than predicted.

Mechanical

1 The total energy costs for the Tisdale Complex for the 12 months monitored were some 23% higher than Humboldt on a $/sq. m. basis.

2 The actual energy costs for the Tisdale Complex for the 1983 monitoring period were some 292% higher than the computer predictions.

3 The swimming pool "heat sink" is not yet in place in Tisdale. This, however would not reduce the level of consumption for the existing structure. It may reduce heating costs for the pool water when the swimming pool is constructed.

4 The equipment to reclaim the waste heat in effect converts the thermal energy to electrical energy and with the cost of electrical energy being some four times that of natural gas the total operating costs are in fact increased.

5 The most efficient way to utilize reclaimed heat (and the only competative way with natural gas available) is to utilize it directly without further processing by heat pumps, etc.
This would be in a manner similar in concept to the standard hot water radiator system. Because about 85% of the reclaimed heat is low temperature (i.e. in the order of 30 degrees C) it becomes very difficult without heat pumps to heat spaces that are only a few degrees lower - say the concourse area at 20 degrees C. The temperature differential is so small that the required area of direct radiation is very large. One way would be to run heating pipes in the floor.

6 In this case it would have been much more practicable to heat the colder areas of the building (say the arena and curling ice area spaces). These areas are maintained at about 5 degrees C and the temperature differential is about 25 degrees C thus direct heat transfer can be much more easily attained.

APPENDIX "A"

HUMBOLDT

MONTHLY RECORD RÉSUMÉ MENSUEL	JAN 1933 JAN	4013401 HUMBOLDT SASK / SASK LAT 52° 16 'N LONG 105° 07 'W ALT 549 m	REF 006.L05

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS <18°C	DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS <18°C
1				-8.0	-11.0	-9.5		27.5	17				-11.5	-25.5	-18.5		36.5
2				-8.0	-14.5	-11.3		29.3	18				-9.0	-16.0	-12.5		30.5
3		3.0	3.0	-4.0	-12.5	-8.3		26.3	19		T	T	-9.0	-11.0	-10.0		28.0
4				-6.5	-14.0	-10.3		28.3	20		1.0	1.0	-6.0	-10.0	-8.0		26.0
5				-8.0	-18.0	-13.0		31.0	21		T	T	-7.5	-10.0	-8.8		26.8
6				-8.0	-12.5	-10.3		28.3	22		3.0	3.0	-6.5	-8.5	-7.5		25.5
7				-5.0	-14.5	-9.8		27.8	23		8.0	8.0	-14.0	-16.5	-15.3		33.3
8				-0.5	-11.0	-5.8		23.8	24				-23.0	-29.5	-26.3		44.3
9				-5.5	-13.0	-9.3		27.3	25				-28.0	-33.0	-33.0		51.0
10		1.0	1.0	-11.0	-18.0	-14.5		32.5	26				-17.0	-37.0	-27.0		45.0
11				-9.0	-34.0	-21.5		39.5	27				-8.5	-23.0	-15.8		33.8
12				-7.5	-19.0	-13.3		31.3	28				-11.0	-14.0	-12.5		30.5
13		T	T	-10.0	-14.5	-12.3		30.3	29				-10.0	-14.5	-12.3		30.3
14				-9.0	-22.0	-15.5		33.5	30				-6.5	-21.0	-13.8		31.8
15				-5.5	-17.5	-11.5		29.5	31		2.0	2.0	-6.5	-14.0	-10.3		28.3
16				-21.5	-25.0	-23.3		41.3	∴								

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION/S

	TOTAL	% OF DE LA NORMALE	EXTREMES
R/P	0.0		
S/N	18.0		8.0
P	18.0		8.0

TEMPERATURE

	MEAN MOY	°C FROM DE LA NORMALE	EXTREMES
MAX	-9.7		-0.5
MIN	-18.0		-38.0
MN	-13.9		

SUNSHINE/INSOLATION DEG-DAYS/DEG JOURS < 18° C

	TOTAL	% POSSIBLE	% OF DE LA NORMALE
SUN/INSOL			
DEG-DYS/JRS	989.1		

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES ≤ 0°C	31
RAIN OR DRIZZLE/PLUIE OU BRUINE	
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	6
SNOW/NEIGE	6
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	U
HAIL/GRÊLE	U
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61	MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
PREVAILING/DOMINANT																												
MAXIMUM																												
PEAK/POINTE																												

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION/DURÉES	MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm) 5 mn	10 mn	15 mn	30 mn	60 mn	120 mn	6 h	12 h	24 h	HOURS OF RAINFALL - mm CLASSES HEURES DE PLUIE FRÉQ. PAR CLASSE (mm) 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
AMOUNT/HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE [illegible]
S/N - SNOWFALL/NEIGE [illegible]
M - MISSING/MANQUANTE
SVL - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ
E - ESTIMATE/ESTIMATIVE
T - TRACE

MONTHLY RECORD
RÉSUMÉ MENSUEL

FEB 1933 FEV 4013401 HUMBOLDT SASK / SASK REF 006.106

LAT 52° 16 'N LONG 105° 07 'W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS -18 C
1				-10.0	-18.0	-14.0		32.0
2		2.0	2.0	-15.5	-26.5	-21.0		39.0
3				-21.0	-26.0	-23.5		41.5
4				-18.5	-25.5	-22.0		40.0
5				-19.5	-34.5	-27.0		45.0
6				-14.0	-29.0	-21.5		39.5
7				-16.5	-21.5	-19.0		37.0
8				-17.0	-23.5	-20.3		38.3
9				-9.0	-21.0	-15.0		33.0
10				-10.0	-13.0	-11.5		29.5
11				-5.0	-12.5	-8.8		26.8
12				M	-7.0	M		25M
13				M	M	M		25M
14				3.0	-11.5	-4.3		22.3
15				0.5	-9.5	-4.5		22.5
16		3.0	3.0	-16.0	-17.5	-16.8		34.8
17		T	T	-15.0	-20.0	-17.5		35.5
18		0.5	0.5	-14.0	-17.5	-15.8		33.8
19				-10.0	-15.5	-12.8		30.8
20		T	T	-2.0	-17.0	-9.5		27.5
21				0.0	-5.0	-2.5		20.5
22				1.5	-15.0	-6.8		24.8
23				-8.0	-17.5	-12.8		30.8
24				0.0	-10.5	-5.3		23.3
25				1.5	-4.0	-1.3		19.3
26				0.0	-6.0	-3.0		21.0
27				-10.0	-10.0	-10.0		28.0
28				-10.0	-17.0	-13.5		31.5
29								
30								
31								
∴								

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% DE LA NORMALE	EXTRÊMES
R/P	0.0		
S/N	5.5		3.0
P	5.5		3.0

TEMPERATURE

	MEAN MOY	CT. DE LA NORMALE	EXTRÊMES
MAX	-9.0		3.0
MIN	-16.7E		-34.5
MN	-12.9E		

SUNSHINE INSOLATION
DEG-DAYS-DEG JOURS - 18 C

	TOTAL	POSSIBLE	% DE LA NORMALE
SUN/INSOL			
DEG DAYS	M 858.0		

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES 0 C	28
RAIN OR DRIZZLE PLUIE OU BRUINE	
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	3
SNOW NEIGE	3
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	U
HAIL GRÊLE	U
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

SYNOPTICS/SYNOPTIQUES

MEAN/MOYENNE

HOUR HEURE	PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS DIXIÈMES 0 2	3 7	8 10	VISIBILITY km VISIBILITÉ <1	1-10	>10

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT												
MAXIMUM												
PEAK/POINTE												

MEAN SPEED IN km/h PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT mm HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL mm CLASSES HEURES DE PLUIE FRÉQ. PAR CLASSE mm 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
AMOUNT/HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION [illegible]

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
P - PRECIPITATION(S)
∴ SNOW ON GROUND/NEIGE AU SOL (cm)
• [illegible]
S/N - SNOWFALL/NEIGE
N - [illegible]
• [illegible]
M - MISSING/MANQUANTE
U - NOT OBSERVED [illegible]
E - ESTIMATE/ESTIMATIVE
- DATA MISSING [illegible]
P - [illegible]

MONTHLY RECORD
RÉSUMÉ MENSUEL

MAR 1923 MARS

4013401 HUMBOLDT SASK / SASK REF 006.M36

LAT 52° 16 'N LONG 105° 07 'W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R P mm	S N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS 18 C
1		6.0	6.0	-7.0	-12.5	-9.8		27.8
2				-6.0	-11.5	-8.8		26.8
3		T	T	-1.5	-7.0	-4.3		22.3
4				-1.5	-4.0	-2.8		20.8
5	M	T	M	-3.0	M	M		25M
6		1.0	1.0	-11.0	-15.0	-13.0		31.0
7				-7.0	-15.5	-11.3		29.3
8				-6.0	-13.0	-9.5		27.5
9				0.0	-8.0	-4.0		22.0
10				2.0	-4.0	-1.0		19.0
11				M	0.0	M		20M
12				1.0	M	M		20M
13				2.5	-6.0	-1.8		19.8
14		T	T	-7.0	-11.5	-9.3		27.3
15		T	T	-4.0	-9.5	-6.8		24.8
16				-4.0	-10.0	-7.0		25.0

DATE	PRECIPITATION(S) R P mm	S N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS 18 C
17				-10.0	-20.5	-15.3		33.3
18				-11.0	-18.0	-14.5		32.5
19				-9.5	-22.0	-15.8		33.8
20				-11.0	-23.0	-17.0		35.0
21				-9.0	-20.5	-14.8		32.8
22				-9.0	-20.5	-14.8		32.8
23		1.0	1.0	-3.0	-13.0	-8.0		26.0
24		4.0	4.0	-3.0	-6.0	-4.5		22.5
25				-7.0	-10.5	-8.8		26.8
26				-6.5	-24.5	-15.5		33.5
27				-4.0	-16.0	-10.0		28.0
28				0.0	-12.0	-6.0		24.0
29				3.5	-8.5	-2.5		20.5
30		T	T	1.0	-4.0	-1.5		19.5
31		1.0	1.0	0.0	-2.5	-1.3		19.3
∴								

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL % DE LA NORMALE	EXTREME
R P	M		
S N	13.0		6.0
P	M		6.0

TEMPERATURE

	MEAN MOY	DEPARTURE FROM NORMAL	EXTREME
MAX	-4.4		3.5
MIN	-12.0		-24.5
MN	-8.2		

SUNSHINE INSOLATION
DEG DAYS DEG JOURS 18 C

	TOTAL	POSSIBLE	% OF NORMAL
SUN INSOL			
DEG DAYS	M 808.7		

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS DIXIÈMES 0 2	3 7	8 10	VISIBILITY km VISIBILITÉ <1	1 10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES > 0 C	31
RAIN OR DRIZZLE PLUIE OU BRUINE	M
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	M
SNOW NEIGE	5
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	U
HAIL GRÊLE	U
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1 5	6 11	12 19	20 28	29 38	39 49	50 61	>61
PREVAILING/DOMINANT												
MAXIMUM												
PEAK POINTE												

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT HAUTEUR									
DATE(S)									

HOURS OF RAINFALL mm CLASSES
HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2 2.9	3.0 4.9	5.0 12.9	13.0 24.9	25.0 49.9	50.0 +

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN MOYENNE QUOTIDIENNE WIND km PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	EVAPOTRANSPIRATION mm

EXPLANATION OF CODES/EXPLICATION DES CODES

R P RAINFALL PLUIE
S N SNOWFALL NEIGE
P PRECIPITATIONS
N SNOW ON ICE
∴ SNOW ON GROUND NEIGE AU SOL cm
• LESS THAN 0.5 INFÉRIEURE À 0.5
M MISSING MANQUANTE
E ESTIMATE ESTIMATIVE
U NOT OBSERVED
DATA MISSING FOR ONE OR MORE DAYS

MONTHLY RECORD
RÉSUMÉ MENSUEL

APR 1983 AVR 4013401 HUMBOLDT SASK / SASK REF 007.N05

LAT 52° 16'N LONG 105° 07'W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
1				2.0	-11.0	-4.5		22.5
2				0.0	-8.5	-4.3		22.3
3				2.0	-4.0	-1.0		19.0
4				4.0	-7.5	-1.8		19.8
5				6.0	-3.5	1.3		16.7
6				7.0	-3.0	2.0		16.0
7				10.0	-2.0	4.0		14.0
8				7.5	1.0	4.3		13.7
9				2.0	-4.0	-1.0		19.0
10		3.0	3.0	-3.0	-8.0	-5.5		23.5
11				-6.0	-8.0	-7.0		25.0
12				-5.5	-13.5	-9.5		27.5
13				0.0	-11.0	-5.5		23.5
14				5.5	-6.0	-0.3		18.3
15				-2.0	-5.0	-3.5		21.5
16		T	T	-0.5	-5.0	-2.8		20.8
17				7.0	-1.5	2.8		15.2
18				13.0	-2.0	5.5		12.5
19				12.0	0.5	6.3		11.7
20				14.5	1.0	7.8		10.2
21				13.0	2.0	7.5		10.5
22				17.5	2.0	9.8		8.2
23				21.0	3.5	12.3		5.7
24				22.0	6.0	14.0		4.0
25	5.4	4.0	9.4	7.0	2.0	4.5		13.5
26		T	T	0.0	-2.0	-1.0		19.0
27		1.0	1.0	1.0	-4.5	-1.8		19.8
28				3.0	-6.0	-1.5		19.5
29				6.0	-5.5	0.3		17.7
30				10.0	-2.5	3.8		14.2
31								
∴		0						

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL / % DE LA NORMALE	EXTREMES
R/P	5.4		5.4
S/N	8.0		4.0
P	13.4		9.4

TEMPERATURE

	MEAN/MOY	DEP. FROM NORMAL / CARTE DE LA NORMALE	EXTREMES
MAX	5.9E		22.0
MIN	-3.5E		-13.5
MN	1.2E		

SUNSHINE INSOLATION
DEG-DAYS/DEG JOURS < 18° C

	TOTAL	% POSSIBLE	% OF NORMAL / % DE LA NORMALE
SUN/INSOL			
DEG-DAYS/JRS	504.8		

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE: PRESSURE PRESSION kPa: STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS: CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	22
RAIN OR DRIZZLE/PLUIE OU BRUINE	1
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	3
SNOW/NEIGE	3
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	U
HAIL/GRÊLE	U
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h: 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT												
MAXIMUM												
PEAK/POINTE												

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL - mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm: 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
AMOUNT/HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE: TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C: WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
S/N - SNOWFALL/NEIGE
P - PRECIPITATION(S)
N - [illegible]
∴ SNOW ON GROUND AT END OF MONTH (cm) [illegible]
[illegible]
M - MISSING/MANQUANTE
SVL - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ
E - ESTIMATE/ESTIMATIVE
T - TRACE

TEMPERATURE CHECK LISTING FOR AREAS F

MAY 1983 LISTING OF M

STATION NAME			1	2	3	4	5	6	7	8	9	10	11
HAGUE 52 30 N 106 29 W	3560	08	110	140	90	160	160	120	200	200	130	-10	30
MARTENSVILLE 52 20 N 106 40 W	5050	02	120	165	90	175	180	160	225	215	125	0	45
DANA CFB 52 17 N 105 46 W	1860	07	120	150	120	150	180	110	200	215	140	60	20
HUMBOLDT 52 16 N 105 7 W	3860	02	110	130	80	155	140	110	200	190	165	-30	20
MUENSTER 52 11 N 105 0 W	5540	03	125	125	80	140	145	105	195	190	160	-20	5
SASKATOON WATER 52 7 N 106 41 W	7740	04	120	150	90	180	165	140	200	205	130	5	30
SASKATOON 2 52 7 N 106 40 W	7720	04	125	155	100	190	175	150	220	215	135	15	40
SASKATOON CENTRA 52 6 N 106 36 W	7660	04	115	145	90	180	180	160	205	210	140	0	50
SASKATOON SRC 52 9 N 106 36 W	7700	04	110	145	85	180	165	145	205	205	140	10	10
VANSCOY COMINCO 52 1 N 107 6 W	9000	05	110	155	85	175	170	150	205	210	115	5	35
VISCOUNT 51 57 N 105 38 W	9060	05	140	140	95	165	170	140	210	200	170	-25	25
LENEY 51 53 N 107 31 W	4580	08	105	175	-999	-999	180	-999	210	210	110	25	25
DUNDURN 51 48 N 106 30 W	2280	01	130	150	95	180	170	155	215	210	145	-10	0
GUERNSEY 51 48 N 105 17 W	3480	08	145	135	95	165	170	140	200	200	175	-20	25
HARRIS 51 44 N 107 35 W	3560	02	95	165	95	165	180	175	210	215	110	15	50
DAVIDSON 51 16 N 105 59 W	1900	09	120	140	100	180	145	170	200	200	150	-20	30
MEANS			118	147	92	170	167	142	206	205	140	0	27
STANDARD DEV			12	13	9	14	13	21	8	8	20	22	14

MAY 1983 LISTING OF M

HAGUE 52 30 N 106 29 W	3560	08	50	20	-20	0	0	0	30	90	50	-30	-110
MARTENSVILLE 52 20 N 106 40 W	5050	02	25	-20	-30	-10	0	-10	35	80	40	-35	-120
DANA CFB 52 17 N 105 46 W	1860	07	50	20	-10	0	30	-10	25	75	40	-50	-80
HUMBOLDT 52 16 N 105 7 W	3860	02	30	20	-15	0	5	-10	5	65	40	-50	-60
MUENSTER 52 11 N 105 0 W	5540	03	25	5	-15	15	10	-5	0	55	45	-55	-65
SASKATOON WATER 52 7 N 106 41 W	7740	04	30	0	-20	20	30	10	50	110	60	-25	-70
SASKATOON 2 52 7 N 106 41 W	7720	04	30	-10	-20	20	25	10	40	90	60	-25	-70
SASKATOON CENTRA 52 6 N 106 36 W	7660	04	30	0	-10	20	25	5	30	90	50	-20	-70
SASKATOON SRC 52 9 N 106 36 W	7700	04	30	-10	-20	20	10	-5	45	90	60	-70	-90
VANSCOY COMINCO 52 1 N 107 6 W	9000	05	30	5	-20	0	20	5	60	70	50	-25	-110
VISCOUNT 51 57 N 105 38 W	9060	05	25	-5	-25	-5	10	-5	15	85	45	-40	-80
LENEY 51 53 N 107 31 W	4580	08	40	-40	-30	-777	10	-888	40	50	45	-25	-110
DUNDURN 51 48 N 106 30 W	2280	01	20	10	-25	10	35	5	65	85	45	-25	-120
GUERNSEY 51 48 N 105 17 W	3480	08	30	0	-10	-5	15	-5	55	70	55	-40	-50
HARRIS 51 44 N 107 35 W	3660	02	0	-30	-30	15	20	0	50	80	45	-30	-90
DAVIDSON 51 16 N 105 59 W	1900	09	-20	0	-30	0	10	25	20	90	70	-30	-70
MEANS			26	-2	-20	6	15	0	35	79	50	-35	-85
STANDARD DEV			16	17	7	10	10	9	19	15	8	13	22

MAXIMUM(C) TEMPERATURES

12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
60	120	60	90	170	200	180	180	170	140	140	70	160	270	260	240	210	230	160	190
70	135	85	100	185	200	180	200	175	140	170	100	170	275	270	230	210	220	170	200
40	120	30	75	150	175	165	170	170	120	145	70	150	230	250	240	200	200	180	175
50	100	10	75	160	180	170	170	180	120	140	90	145	245	250	220	195	210	160	170
50	105	10	70	150	175	170	165	175	105	145	90	145	240	255	220	190	205	160	165
80	120	80	90	175	190	180	160	170	140	160	110	170	270	290	230	210	220	160	190
90	130	85	100	185	205	185	195	180	145	170	105	170	285	285	250	220	235	175	210
70	130	80	95	175	195	175	190	180	140	170	110	170	280	270	230	220	210	170	195
60	110	60	90	165	195	175	180	170	135	155	100	165	270	260	230	210	225	160	190
75	140	80	90	180	200	175	185	180	140	165	100	170	280	265	230	210	220	155	190
60	115	30	80	170	190	175	185	180	130	160	115	155	260	265	230	200	205	160	195
65	135	85	100	185	205	180	190	170	140	170	110	175	265	280	235	225	235	165	200
50	125	80	90	175	195	175	175	165	140	170	115	185	265	275	235	210	220	160	205
35	120	15	75	160	185	175	170	185	120	165	125	155	245	260	230	205	210	160	185
75	130	100	100	190	205	185	185	180	140	150	120	180	290	280	245	230	205	165	200
45	120	100	90	115	190	200	200	175	175	180	140	140	235	270	220	200	200	155	170
63	123	61	88	168	192	177	181	175	135	159	104	162	264	267	232	209	215	163	189
14	13	32	10	18	9	7	12	5	15	12	18	13	19	11	8	10	11	7	13

MINIMUM(C) TEMPERATURES

-50	0	10	-50	10	20	70	10	60	50	40	50	-20	80	90	90	40	60	20	40
-60	-5	15	-70	15	15	60	-10	50	50	30	40	-25	50	90	85	40	30	0	20
-30	10	5	-60	-10	20	90	50	70	60	45	55	10	70	110	100	70	95	30	20
-25	10	-20	-50	-10	30	80	-5	40	70	25	40	-15	50	90	130	45	75	20	35
-75	5	-20	-50	-10	40	80	10	70	60	30	40	-20	60	95	130	60	80	25	50
-35	10	10	-30	30	55	70	20	80	60	50	60	10	90	120	120	80	70	50	50
-40	0	15	-40	25	55	80	10	75	60	40	75	5	80	120	125	85	55	45	45
-50	20	20	-20	25	50	80	20	75	60	50	60	5	80	120	120	70	70	40	50
-70	5	-10	-35	30	50	90	0	70	60	45	55	-10	75	110	95	35	45	5	35
-50	15	15	-45	25	55	70	0	60	50	40	60	15	70	100	105	70	40	35	20
-30	5	10	-65	5	35	85	-5	75	65	30	60	-5	50	90	130	45	50	25	25
-65	0	5	-50	20	50	65	-5	50	50	20	50	5	50	120	105	50	35	10	10
-65	-5	10	-40	15	35	80	10	60	60	35	60	10	85	105	125	40	55	10	35
-70	15	-5	-60	-5	40	90	-5	75	75	35	55	-5	30	90	135	50	65	30	30
-50	0	10	-45	5	45	70	10	35	50	35	20	15	65	115	105	55	50	30	30
-50	0	10	-50	0	40	90	25	40	50	40	30	20	40	100	75	50	50	20	40
-47	5	5	-47	10	39	78	8	61	58	36	50	0	64	104	110	55	57	24	33
14	7	12	12	14	13	9	15	14	7	8	13	14	17	12	18	15	17	14	12

MONTHLY RECORD
RÉSUMÉ MENSUEL

JUN 1983 JUIN | 4013401 | HUMBOLDT | SASK / SASK. | [illegible] 007.0

LAT 52 °16 'N | LONG 105 °07 'W | ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUN SHINE h	DEGREE DAYS 18 C
1	4.4		4.4	22.0	10.0	16.0		2.0
2	T		T	13.0	8.0	10.5		7.5
3	1.2		1.2	8.0	4.0	6.0		12.0
4	0.8		0.8	13.0	5.0	9.0		9.0
5				18.0	2.5	10.3		7.7
6				24.0	2.0	13.0		5.0
7	4.6		4.6	19.0	10.5	14.8		3.2
8				24.0	4.0	14.0		4.0
9	0.2		0.2	29.0	12.0	20.5		
10				30.0	10.0	20.0		
11	15.2		15.2	23.0	16.5	19.8		
12	15.2		15.2	13.0	10.5	11.8		6.2
13	3.0		3.0	20.0	8.0	14.0		4.0
14	6.0		6.0	16.0	9.0	12.5		5.5
15				18.0	3.0	10.5		7.5
16				24.0	7.0	15.5		2.5

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUN SHINE h	DEGREE DAYS 18 C
17				26.0	10.5	18.3		
18	T		T	24.0	14.0	19.0		
19	T		T	23.0	10.0	16.5		1.5
20				23.0	8.0	15.5		2.5
21	0.4		0.4	22.0	8.0	15.0		3.0
22	T		T	21.5	10.5	16.0		2.0
23	2.0		2.0	24.0	6.0	15.0		3.0
24	16.4		16.4	26.0	14.0	20.0		
25	0.2		0.2	20.0	13.0	16.5		1.5
26	T		T	14.0	8.0	11.0		7.0
27				19.0	6.0	12.5		5.5
28				24.0	5.0	16.0		2.0
29				25.5	13.5	19.5		
30				M	13.5	M		M
31								
		0						

MONTHLY SUMMARY - SOMMAIRE MENSUEL

PRECIPITATION

	TOTAL	GREATEST IN A DAY
R/P	69.6	16.4
S/N	0.0	
P	69.6	16.4

TEMPERATURE

	MEAN MOY	EXTREME
MAX	20.9	30.0
MIN	8.8E	2.0
MN	14.9E	

SUNSHINE INSOLATION | DEG DAYS DEG JOURS 18

	TOTAL
DEG	M

SYNOPTICS/SYNOPTIQUES

MEAN/MOYENNE

HOUR HEURE	PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	CLOUD AMOUNT NÉBULOSITÉ 0-2	3-7	8-10	VISIBILITY VISIBILITÉ km <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES 0 C	
RAIN OR DRIZZLE PLUIE OU BRUINE	13
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	13
SNOW NEIGE	
THUNDERSTORMS ORAGES	1
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	0
HAIL GRÊLE	0
FOG BROUILLARD	0
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	0
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE-SABLE ÉLEVÉ	0
BLOWING SNOW CHASSE-NEIGE ÉLEVÉE	0

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING DOMINANT												
MAXIMUM												
FASTEST MILE												

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS | TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION DURÉE	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT									
DATE									

EVAPORATION

EXPLANATION OF CODES/EXPLICATION DES CODES

MONTHLY RECORD
RÉSUMÉ MENSUEL

JUL 1983 JUIL

4013401 HUMBOLDT SASK / SASK

LAT 52° 16' N LONG 105° 07' W ALT 549 m

[illegible] 007.P06

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R.P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS-JOURS -18°C	DATE	PRECIPITATION(S) R.P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS-JOURS -18°C
1	0.6		0.6	23.5	15.5	18.5			17	0.2		0.2	22.0	9.0	15.5		2.5
2	10.2		10.2	19.0	13.0	16.0		2.0	18				24.0	7.0	15.5		2.5
3	4.8		4.8	16.0	14.0	15.0		3.0	19				28.0	15.0	21.5		
4	0.4		0.4	14.0	7.5	10.8		7.2	20	9.6		9.6	26.0	16.0	21.0		
5				25.0	6.0	15.5		2.5	21				24.0	16.5	20.3		
6	T		T	30.0	11.5	20.8			22				20.5	12.5	16.5		1.5
7				30.0	17.0	23.5			23	T		T	25.0	9.5	17.3		.7
8	11.4		11.4	23.5	15.0	19.3			24				25.5	12.0	18.8		
9				26.0	16.0	21.0			25	2.8		2.8	29.0	12.5	20.8		
10	25.8		25.8	16.0	13.0	14.5		3.5	26	T		T	25.0	18.0	21.5		
11	T		T	23.5	11.0	17.3		.7	27				24.0	8.0	16.0		2.0
12	T		T	27.0	13.5	20.3			28	1.4		1.4	23.0	9.0	16.0		2.0
13				24.0	14.5	19.3			29	19.8		19.8	23.5	10.0	16.8		1.2
14	11.0		11.0	26.5	13.0	19.8			30	T		T	23.0	12.0	17.5		.5
15				19.0	12.0	15.5		2.5	31	T		T	26.0	10.0	18.0		
16				20.5	11.0	15.8		2.2	∴		0						

MONTHLY SUMMARY - SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	DIFF. FROM NORMAL	EXTREME
R.P	98.0		25.8
S/N	0.0		
P	98.0		25.8

TEMPERATURE

	MEAN	DIFF. FROM NORMAL	EXTREME
MAX	23.6		30.0
MIN	12.2		6.0
MN	17.9		

SUNSHINE INSOLATION DEG DAYS DEG JOURS -18°C

	TOTAL	POSSIBLE	NORMAL
SUN INSOL			
DEG DAYS	36.5		

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0°C	
RAIN OR DRIZZLE PLUIE OU BRUINE	12
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	12
SNOW NEIGE	
THUNDERSTORMS ORAGES	4
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	U
HAIL GRÊLE	U
FOG BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-29	30-38	39-49	50-61	>61
PREVAILING/DOMINANT												
MAXIMUM												
PEAK/POINTE												

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES FLUVIOGRAPHES

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm)

DURATION DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT HAUTEUR									
DATES									

HOURS OF RAINFALL mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+

EVAPORATION

WATER LOSS mm / PERTE D'EAU

DAILY MEAN MOYENNE QUOTIDIENNE

TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	[illegible]

EXPLANATION OF CODES/EXPLICATION DES CODES

R.P RAINFALL PLUIE
S/N SNOWFALL NEIGE
DATA MISSING FOR ONE OR MORE DAYS [illegible]
P PRECIPITATIONS
N SNOW ON THE GROUND [illegible]
∴ SNOW ON GROUND NEIGE AU SOL (cm)
• LESS THAN .5 INFÉRIEURE À 0.5
[illegible] [illegible] OBSERVATION [illegible]
* FIRST OF SEVERAL PREMIER DE PLUSIEURS
M MISSING MANQUANTE
SVL SEVERAL PLUSIEURS
U NOT OBSERVED [illegible]
E ESTIMATE ESTIMATIVE

MONTHLY RECORD
RÉSUMÉ MENSUEL

AUG 1983 AOUT

4013401 HUMBOLDT SASK / SASK REF 007.006

LAT 52° 16 'N LONG 105° 07 'W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS < 18°C
1	0.2		0.2	27.0	13.0	20.0		
2	T		T	31.5	14.0	22.8		
3	T		T	33.0	16.0	24.5		
4				31.0	18.0	24.5		
5				29.5	12.5	21.0		
6				35.5	18.0	26.8		
7				26.0	15.0	20.5		
8				26.0	6.5	16.3		1.7
9				29.5	15.5	22.5		
10				28.0	5.5	16.8		1.2
11	2.2		2.2	32.0	11.5	21.8		
12	3.0		3.0	24.0	18.0	21.0		
13				27.0	9.0	18.0		
14				32.0	10.5	21.3		
15	1.8		1.8	25.0	10.5	17.8		.2
16	5.0		5.0	27.0	14.0	20.5		
17				25.0	13.5	19.3		
18	5.8		5.8	22.0	14.0	18.0		
19	0.8		0.8	19.0	7.0	13.0		5.0
20				25.0	10.5	17.8		.2
21				21.0	8.0	14.5		3.5
22				25.0	5.0	15.0		3.0
23	T		T	25.0	9.5	17.3		.7
24	T		T	27.0	11.5	19.3		
25				24.5	9.0	16.8		1.2
26	1.2		1.2	28.0	10.0	19.0		
27				29.0	10.0	19.5		
28				23.0	8.0	18.0		
29				29.0	14.0	21.5		
30				32.0	9.0	20.5		
31				37.0	6.0	21.5		
∴		0						

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL / DE LA NORMALE	EXTREMES
R/P	20.0		5.8
S/N	0.0		
P	20.0		5.8

TEMPERATURE

	MEAN MOY	DIFF FROM NORMAL / DE LA NORMALE	EXTREMES
MAX	27.8		37.0
MIN	11.4		5.0
MN	19.6		

SUNSHINE/INSOLATION DEG DAYS/DEG JOURS < 18° C

	TOTAL	POSSIBLE	% OF NORMAL / DE LA NORMALE
SUN/INSOL			
DEG DAYS	16.7		

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0°C	
RAIN OR DRIZZLE/PLUIE OU BRUINE	8
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	8
SNOW/NEIGE	
THUNDERSTORMS/ORAGES	4
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	U
HAIL/GRÊLE	U
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS CLOUD AMOUNT TENTHS 0-2	3-7	8-10	VISIBILITY km < 1	1-10	> 10

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ BY SPEED CLASS km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	> 61	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
PREVAILING/DOMINANT																												
MAXIMUM																												
PEAK/POINTE																												

MEAN SPEED IN km/h · PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h · FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
AMOUNT/HAUTEUR															
DATE(S)															

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm)

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P RAINFALL/PLUIE
S/N SNOWFALL/NEIGE
P PRECIPITATION(S)
N SNOW CAUGHT IN COVERS
∴ SNOW ON GROUND/NEIGE AU SOL (cm)
• LESS THAN 0.5%/INFÉRIEUR À 0.5%
✦ FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M MISSING/MANQUANTE
SVL SEVERAL/PLUSIEURS
U NOT OBSERVED/NON OBSERVÉ
E ESTIMATED/ESTIMATIVE
T TRACES
DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS

MONTHLY RECORD
RÉSUMÉ MENSUEL

SEP 1983 SEPT

4013401 HUMBOLDT SASK / SASK

LAT 52 ° 16 ' N LONG 105 ° 07 ' W ALT 549 m

RI007.A07

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R·P mm	S·N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE/INSOLATION h	DEGREE DAYS/DEGRÉS-JOURS <18 C
1				31.0	11.0	21.0		
2	1.6		1.6	23.0	14.0	18.5		
3				23.0	12.0	17.5		.5
4	1.8		1.8	22.0	7.0	14.5		3.5
5	14.4		14.4	13.0	10.0	11.5		6.5
6	T		T	15.0	9.0	12.0		6.0
7	T		T	23.0	8.0	15.5		2.5
8	6.2		6.2	20.0	4.0	12.0		6.0
9	18.4		18.4	11.0	9.0	10.0		8.0
10	0.4		0.4	13.0	5.5	9.3		8.7
11	0.4		0.4	12.5	2.0	7.3		10.7
12	0.4		0.4	14.0	1.5	7.8		10.2
13				15.0	0.0	7.5		10.5
14	T		T	15.0	5.5	10.3		7.7
15	T		T	15.5	-0.5	7.5		10.5
16	0.4		0.4	17.0	7.5	12.3		5.7

DATE	PRECIPITATION(S) R·P mm	S·N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE/INSOLATION h	DEGREE DAYS/DEGRÉS-JOURS <18 C
17	9.6		9.6	8.0	4.0	6.0		12.0
18	0.4	T	0.4	6.5	2.5	4.5		13.5
19				5.5	-0.5	2.5		15.5
20				5.5	-2.0	1.8		16.2
21				7.5	-4.5	1.5		16.5
22	T		T	14.0	-6.0	4.0		14.0
23				22.5	0.0	11.3		6.7
24	0.4		0.4	17.0	5.0	11.0		7.0
25				22.0	2.0	12.0		6.0
26				25.5	7.5	16.5		1.5
27		T	T	20.5	10.5	15.5		2.5
28				5.5	-1.0	2.3		15.7
29				10.0	-8.0	1.0		17.0
30	0.4		0.4	6.0	-6.5	-0.3		18.3
31								
∴		0						

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL / % DE LA NORMALE	EXTREME
R·P	54.8		18.4
S·N	T		
P	54.8		18.4

TEMPERATURE

	MEAN MOY	[illegible] NORMAL	EXTREMES
MAX	15.3		31.0
MIN	3.6		-8.0
MN	9.5		

SUNSHINE INSOLATION / DEG DAYS DEGRÉS-JOURS <18 C

TOTAL NORMALE

DEG 259.4

SYNOPTICS/SYNOPTIQUES

MEAN/MOYENNE

HOUR/HEURE	PRESSURE STATION	SEA LEVEL/NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT/POINT DE ROSÉE °C	VAPOUR PRESSURE/TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS/NOMBRE D'OBSERVATIONS CLOUD AMOUNT/NÉBULOSITÉ 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	10
RAIN OR DRIZZLE/PLUIE OU BRUINE	13
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	13
SNOW/NEIGE	
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	U
HAIL/GRÊLE	U
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE-SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE-NEIGE ÉLEVÉE	U

WIND/VENT

DIRECTION | SPEED/VITESSE km/h | DATE | PERCENTAGE FREQUENCY BY SPEED CLASS/FRÉQUENCE DE LA CLASSE DE VITESSE EN POURCENTAGE

MEAN SPEED IN km/h · PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h · FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION/DURÉES 5 min 10 min 15 min 30 min 60 min 120 min 6 h 12 h 24 h

EVAPORATION

WATER LOSS/PERTE D'EAU · DAILY MEAN/MOYENNE QUOTIDIENNE · TEMPERATURE C · WATER/DE L'EAU · AIR

EXPLANATION OF CODES/EXPLICATION DES CODES

[illegible]

MONTHLY RECORD
RÉSUMÉ MENSUEL

OCT 1983 OCT

4013401 HUMBOLDT SASK / SASK REF 007.007

LAT 52° 16'.4 LONG 105° 07'W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ-JOURS < 18°C
1				5.0	1.0	3.0		15.0
2				M	M	M		M
3				8.5	4.0	6.3		11.7
4	4.4		4.4	15.5	4.0	9.8		8.2
5				M	M	M		M
6				10.0	-1.0	4.5		13.5
7				M	M	M		M
8				M	M	M		M
9				M	M	M		M
10				9.0	4.5	6.8		11.2
11				M	-5.0	M		M
12				M	M	M		M
13				14.0	-0.5	6.8		11.2
14				M	M	M		M
15	1.6		1.6	M	0.0	M		M
16	T		T	0.5	-1.0	-0.3		18.3

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ-JOURS < 18°C
17				3.0	-11.0	-4.0		22.0
18				7.0	-6.0	0.5		17.5
19				11.0	-3.0	4.0		14.0
20				15.0	3.5	9.3		8.7
21				15.0	-4.0	5.5		12.5
22				18.0	-1.0	8.5		9.5
23	2.0		2.0	11.5	-1.0	5.3		12.7
24				8.0	-3.0	2.5		15.5
25				14.0	-2.5	5.8		12.2
26				19.0	-3.5	7.8		10.2
27				8.0	-4.0	2.0		16.0
28				7.0	-6.0	0.5		17.5
29				11.0	-4.0	3.5		14.5
30				16.0	-6.0	5.0		13.0
31				15.0	3.0	9.0		9.0
∴		0						

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION S.

	TOTAL	% OF NORMAL % DE LA NORMALE	EXTREMES
R/P	8.0 E		4.4
S/N	0.0		
P	8.0 E		4.4

TEMPERATURE

	MEAN MOY	DIFF. FROM NORMAL ÉCART À LA NORMALE	EXTREMES
MAX	11.0E		19.0
MIN	-1.8E		-11.0
MN	4.6E		

SUNSHINE INSOLATION DEG DAYS/DEG JOURS < 18°C

	TOTAL	POSSIBLE	% OF NORMAL
SUN INSOL			
DEG DAYS	M		

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY VISIBILITÉ km <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES > 0°C	19
RAIN OR DRIZZLE PLUIE OU BRUINE	3
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	3
SNOW NEIGE	
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	U
HAIL GRÊLE	U
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61	MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
PREVAILING/DOMINANT																												
MAXIMUM																												
PEAK/POINTE																												

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm) DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL - mm CLASSES HEURES DE PLUIE FRÉQ. PAR CLASSE mm 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	>50.0
AMOUNT HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	EVAPORATION ÉVAPORATION

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P RAINFALL PLUIE
S/N SNOWFALL NEIGE
DATA MISSING FOR ONE OR MORE DAYS VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P PRECIPITATION(S)
N SNOW GAUGE NIVOMÈTRE
∴ SNOW ON GROUND NEIGE AU SOL (cm)
T LESS THAN 0.5% INFÉRIEURE À 0.5%
P SUNSHINE INSOLATION [illegible]
* FIRST OF SEVERAL PREMIER DE PLUSIEURS
M MISSING MANQUANTE
SVL SEVERAL PLUSIEURS
U NOT OBSERVED NON OBSERVÉ
E ESTIMATE ESTIMATIVE

MONTHLY RECORD
RÉSUMÉ MENSUEL

NOV 1983 NOV

4013401 HUMBOLDT SASK / SASK PEP 006.L06

LAT 52 ° 16 ' N LONG 105 ° 07 ' W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS - 18°C
1	0.6		0.6	5.0	-2.5	1.3		16.7
2	1.6		1.6	4.5	-6.0	-0.8		18.8
3	0.2		0.2	10.0	0.5	5.3		12.7
4	0.4		0.4	12.0	5.5	8.8		9.2
5				9.0	-1.0	4.0		14.0
6	1.6		1.6	8.5	-7.0	0.8		17.2
7	0.2	T	0.2	3.5	0.5	2.0		16.0
8				0.0	-2.0	-1.0		19.0
9		1.0	1.0	-0.5	-4.0	-2.3		20.3
10		0.6	0.6	-1.5	-4.0	-2.8		20.8
11		2.6	2.6	-1.0	-4.0	-2.5		20.5
12	T		T	0.0	-3.0	-1.5		19.5
13		T	T	-1.5	-2.5	-2.0		20.0
14				-1.5	-3.0	-2.3		20.3
15				-1.0	-2.5	-1.8		19.8
16				1.5	-3.5	-1.0		19.0

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS - 18°C
17	T		T	1.5	0.5	1.0		17.0
18		T	T	0.5	0.0	0.3		17.7
19		3.6	3.6	0.0	-3.0	-1.5		19.5
20				-4.5	-5.5	-5.0		23.0
21				M	M	M		M
22		2.0	2.0	M	M	M		M
23				M	M	M		M
24				M	M	M		M
25				-10.0	-17.0	-13.5		31.5
26				M	M	M		M
27				M	M	M		M
28		3.0	3.0	M	M	M		M
29				M	M	M		M
30		1.0	1.0	M	-21.0	M		M
31								
∴								

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF / DE LA NORMAL(E)	EXTREMES
R/P	4.6		1.6
S/N	13.8 E		3.6
P	18.4 E		3.6

TEMPERATURE

	MEAN MOY	C FROM / DE LA NORMAL(E)	EXTREMES
MAX	1.6E		12.0
MIN	-3.8E		-21.0
MN	-1.1E		

SUNSHINE/INSOLATION
DEG DAYS/DEG JOURS - 18 C

	TOTAL	POSSIBLE	% OF / DE LA NORMAL(E)
SUN/INSOL			
DEG DYS/JRS	M		

SYNOPTICS/SYNOPTIQUES

MEAN/MOYENNE

HOUR HEURE	PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES > 0 C	26
RAIN OR DRIZZLE/PLUIE OU BRUINE	6
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	13
SNOW/NEIGE	7
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	U
HAIL/GRÊLE	U
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT												
MAXIMUM												
PEAK/POINTE												

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT HAUTEUR									
DATE									

HOURS OF RAINFALL mm CLASSES
HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAP. mm

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
S/N - SNOWFALL/NEIGE
- DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P - PRECIPITATION(S)
N - SNOW GAUGE/NIVOMÈTRE
∴ - SNOW ON GROUND/NEIGE AU SOL cm
* - LESS THAN 0.5/INFÉRIEUR À 0.5
P - SUNSHINE/INSOLATION - POLAR NIGHT/LA NUIT POLAIRE
+ - FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M - MISSING/MANQUANTE
E - ESTIMATE/ESTIMATIVE
SVL - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ

MONTHLY RECORD
RÉSUMÉ MENSUEL

DEC 1983 DEC

4013401 HUMBOLDT SASK / SASK REF 006.E07

LAT 52° 16 'N LONG 105' 07 'W ALT 549 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUN SHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS -18°C
1				-9.5	-21.0	-15.3		33.3
2				-13.5	-22.0	-17.8		35.8
3				-10.0	-21.5	-15.8		33.8
4				-13.0	-19.5	-16.3		34.3
5		T	T	-11.5	-27.5	-19.5		37.5
6		T	T	-11.0	-17.0	-14.0		32.0
7		T	T	-12.5	-24.5	-18.5		36.5
8				-25.5	-32.5	-29.0		47.0
9				-21.5	-34.0	-27.8		45.8
10		10.0	10.0	-18.5	-28.5	-23.5		41.5
11				-14.0	-29.0	-21.5		39.5
12				-12.5	-22.5	-17.5		35.5
13		T	T	-13.5	-24.0	-18.8		36.8
14		4.0	4.0	-18.0	-25.0	-21.5		39.5
15		0.6	0.6	-26.0	-33.0	-29.5		47.5
16				-29.0	-36.0	-32.5		50.5
17				-28.0	-34.5	-31.3		49.3
18				-29.0	-36.5	-32.8		50.8
19				-28.5	-36.0	-32.3		50.3
20				-29.0	-38.0	-33.5		51.5
21				-31.5	-37.5	-34.5		52.5
22		T	T	-34.0	-38.0	-36.0		54.0
23				-32.5	-41.0	-36.8		54.8
24		T	T	-16.5	-36.0	-26.3		44.3
25		T	T	-10.5	-24.0	-17.3		35.3
26		T	T	-11.5	-19.5	-15.5		33.5
27				-13.5	-21.0	-17.3		35.3
28				-16.5	-25.0	-20.8		38.8
29				-14.0	-26.5	-20.3		38.3
30				-18.0	-27.0	-22.5		40.5
31				-8.5	-25.5	-17.0		35.0
∴								

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)	TOTAL	% OF DE LA NORMALE	EXTREMES
R/P	0.0		
S/N	14.6		10.0
P	14.6		10.0

TEMPERATURE	MEAN MOY	DIFF. FROM DE LA NORMALE	EXTREMES
MAX	-18.7E		-8.5
MIN	-28.5		-41.0
MN	-23.6E		

SUNSHINE/INSOLATION DEG-DAYS/DEG-JOURS - 18° C	TOTAL	POSSIBLE	% OF DE LA NORMALE
SUN/INSOL			
DEG-DAYS/JRS	1291.0		

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0 2	3 7	8 10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	31
RAIN OR DRIZZLE/PLUIE OU BRUINE	
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	3
SNOW/NEIGE	3
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	U
HAIL/GRÊLE	U
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1 5	6 11	12 19	20 28	29 38	39 49	50 61	> 61
PREVAILING/DOMINANT												
MAXIMUM												
PEAK/POINTE												

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW

TOTAL HOURS TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT/HAUTEUR									
DATE(S)									

HOURS OF RAINFALL - mm CLASSES
HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2 2.9	3.0 4.9	5.0 12.9	13.0 24.9	25.0 49.9	50.0 +

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P RAINFALL/PLUIE
S/N SNOWFALL/NEIGE
# DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P PRECIPITATION(S)
N SNOW GAUGE/NIVOMÈTRE
∴ SNOW ON GROUND/NEIGE AU SOL (cm)
• LESS THAN 0.5%/INFÉRIEURE À 0.5%
P SUNSHINE/INSOLATION - POLAR NIGHT/LA NUIT POLAIRE
+ FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M MISSING/MANQUANTE
E ESTIMATE/ESTIMATIVE
SVL SEVERAL/PLUSIEURS
U NOT OBSERVED/NON OBSERVÉ
T TRACES

MONTHLY RECORD
RÉSUMÉ MENSUEL

JAN 1983 JAN

4055085 MELFORT CDA SASK / SASK

LAT 52° 49 'N LONG 104° 36 'W ALT 490 m

REF 006.039

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
		N						
1		T	T	-6.0	-15.0	-10.5	4.8	28.5
2		T	T	-6.0	-21.0	-13.5	1.4	31.5
3		1.4	1.4	-5.0	-12.0	-8.5	.0	26.5
4				-4.5	-12.5	-8.5	.1	26.5
5				-8.0	-13.0	-10.5	1.2	28.5
6				-7.5	-15.0	-11.3	.0	29.3
7				-5.0	-12.5	-8.8	.0	26.8
8				0.0	-8.0	-4.0	.0	22.0
9		T	T	-2.0	-13.0	-7.5	5.1	25.5
10		0.8	0.8	-14.5	-17.0	-15.8	.0	33.8
11		0.6	0.6	-13.0	-34.0	-23.5	.0	41.5
12		T	T	-13.5	-22.5	-18.0	.1	36.0
13		0.9	0.9	-11.0	-17.0	-14.0	.0	32.0
14				-7.0	-21.5	-14.3	4.0	32.3
15				-5.5	-20.0	-12.8	6.4	30.8
16				-21.5	-25.5	-23.5	6.1	41.5

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
		N						
17				-11.5	-27.0	-19.3	.0	37.3
18				-10.0	-18.0	-14.0	1.5	32.0
19		T	T	-10.0	-15.0	-12.5	.0	30.5
20		1.6	1.6	-7.0	-11.0	-9.0	.0	27.0
21				-6.5	-11.5	-9.0	.0	27.0
22		1.6	1.6	-4.0	-12.0	-8.0	.0	26.0
23		1.0	1.0	-7.0	-15.0	-11.0	1.9	29.0
24				-24.0	-28.0	-26.0	6.1	44.0
25				-29.0	-35.0	-32.0	2.7	50.0
26				-17.5	-36.5	-27.0	.0	45.0
27	0.8	0.6	1.4	-8.0	-24.0	-16.0	.0	34.0
28		T	T	-11.5	-15.0	-13.3	.1	31.3
29				-10.0	-16.0	-13.0	3.2	31.0
30		T	T	-6.5	-16.0	-11.3	1.9	29.3
31		0.2	0.2	-7.0	-14.5	-10.8	.2	28.8
∴								

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF DE LA NORMALE	EXTREMES
R/P	0.8	999	0.8
S/N	8.7	40	1.6
P	9.5	50	1.6

TEMPERATURE

	MEAN MOY	°C FROM DE LA NORMALE	EXTREMES
MAX	-9.7	6.3	0.0
MIN	-18.5	7.4	-36.5
MN	-14.1	6.8	

SUNSHINE/INSOLATION DEG-DAYS/DEG-JOURS < 18° C

	TOTAL	% POSSIBLE	% OF DE LA NORMALE
SUN/INSOL	46.8	18	48
DEG-DYS/JRS	995.2		82

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES ≤ 0°C	31
RAIN OR DRIZZLE/PLUIE OU BRUINE	1
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	9
SNOW/NEIGE	9
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	1
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h

	DIRECTION	SPEED VITESSE km/h	DATE	0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT	SW	13.8			5		42		2			
MAXIMUM	NW	35	10	•		38		13				
PEAK/POINTE		M										

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION / VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
13.4		14.5		11.9		16.4		16.6		11.6		10.6		15.3	
4		13		9		12		19		21		7		15	

TOTAL HOURS 696 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm) — HOURS OF RAINFALL - mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
AMOUNT/HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
S/N - SNOWFALL/NEIGE
- DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P - PRECIPITATION(S)
N - SNOW GAUGE/NIVOMÈTRE
∴ - SNOW ON GROUND/NEIGE AU SOL (cm)
• - LESS THAN 0.5%/INFÉRIEURE À 0.5%
P - SUNSHINE INSOLATION - POLAR NIGHT/LA NUIT POLAIRE
♦ - FIRST OF SEVERAL/LE PREMIER DE PLUSIEURS
M - MISSING/MANQUANTE
E - ESTIMATE/ESTIMATIVE
SVL - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ
T - TRACE

MONTHLY RECORD
RÉSUMÉ MENSUEL

FEB 1983 FEV

4055085 MELFORT CDA SASK / SASK REF 006.009

LAT 52° 49 'N LONG 104° 36 'W ALT 480 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
		N						
1				-13.5	-18.5	-16.0	4.6	34.0
2		0.8	0.8	-15.5	-29.5	-22.5	.0	40.5
3		1.1	1.1	-20.5	-26.0	-23.3	6.6	41.3
4				-22.5	-27.5	-25.0	6.8	43.0
5				-19.0	-37.0	-28.0	3.0	46.0
6		0.2	0.2	-14.0	-29.0	-21.5	.6	39.5
7				-21.5	-24.5	-23.0	3.4	41.0
8		T	T	-16.0	-27.0	-21.5	.6	39.5
9		T	T	-11.5	-18.0	-14.8	.0	32.8
10		T	T	-10.5	-14.5	-12.5	.0	30.5
11		T	T	-4.0	-12.0	-8.0	.0	26.0
12				3.0	-7.0	-2.0	.0	20.0
13				-6.0	-10.5	-8.3	.0	26.3
14				0.5	-11.0	-5.3	2.5	23.3
15				0.0	-9.5	-4.8	.2	22.8
16				-15.5	-19.0	-17.3	2.4	35.3

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
		N						
17		0.4	0.4	-17.0	-23.0	-20.0	.0	38.0
18		0.5	0.5	-14.0	-19.5	-16.8	.0	34.8
19		0.5	0.5	-9.0	-16.0	-12.5	.0	30.5
20		0.8	0.8	-2.0	-17.0	-9.5	2.8	27.5
21		T	T	-0.5	-6.0	-3.3	6.2	21.3
22				0.0	-11.5	-5.8	8.2	23.8
23				-6.0	-19.0	-12.5	1.9	30.5
24				-0.5	-12.0	-6.3	1.4	24.3
25				2.0	-5.0	-1.5	8.2	19.5
26		T	T	-1.0	-6.0	-3.5	.2	21.5
27		2.7	2.7	-12.0	-15.0	-13.5	.0	31.5
28		T	T	-13.0	-19.0	-16.0	.0	34.0
29								
30								
31								
∴								

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF DE LA NORMALE	EXTREMES
R/P	0.0	0	
S/N	7.0	38	2.7
P	7.0	43	2.7

TEMPERATURE

	MEAN MOY	DIFF DE LA NORMALE	EXTREMES
MAX	-9.3	1.7	3.0
MIN	-17.5	4.1	-37.0
MN	-13.4	2.9	

SUNSHINE INSOLATION DEG DAYS DEG JOURS < 18° C

	TOTAL	% POSSIBLE	% OF DE LA NORMALE
SUN/INSOL	59.6	22	48
DEG DYS JRS	879.0		91

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	28
RAIN OR DRIZZLE PLUIE OU BRUINE	
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	8
SNOW NEIGE	8
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	
HAIL GRÊLE	
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE-SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE-NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE
PREVAILING/DOMINANT	NE	14.9	
MAXIMUM	S	58	24
PEAK POINTE		M	

PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h

0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
*	10	28	42	14	3	2	1	

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION / VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Speed	9.5		14.4		13.9		18.3		18.1		11.9		8.4		14.4	
%	4		25		10		19		20		11		6		5	

TOTAL HOURS 638 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT HAUTEUR									
DATE(S)									

HOURS OF RAINFALL mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R.P. RAINFALL PLUIE
P PRECIPITATION(S)
N [illegible]
∴ SNOW ON GROUND [illegible]
* LESS THAN 0.5 [illegible]
+ [illegible]
M MISSING MANQUANTE
SVL SEVERAL PLUSIEURS
U NOT [illegible]
E ESTIMATE ESTIMATIVE

MONTHLY RECORD
RÉSUMÉ MENSUEL

MAR 1983 MARS

4055085 MELFORT CDA SASK / SASK

LAT 52° 49 'N LONG 104° 36 'W ALT 480 m

REF 006.E09

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R.P mm	S.N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS 18 C
		N						
1		2.4	2.4	-9.0	-17.0	-13.0	.0	31.0
2		1.8	1.8	-6.5	-10.5	-8.5	1.4	26.5
3		0.4	0.4	-3.0	-8.0	-5.5	.0	23.5
4		T	T	-2.0	-5.0	-3.5	.0	21.5
5		4.4	4.4	-10.0	-11.0	-10.5	.0	28.5
6		T	T	-11.0	-15.0	-13.0	.0	31.0
7				-7.5	-14.0	-10.8	1.6	28.8
8				-7.0	-18.5	-12.8	2.7	30.8
9				-6.0	-19.5	-12.8	3.5	30.8
10				1.5	-8.0	-3.3	3.4	21.3
11				2.0	-3.0	-0.5	.6	18.5
12		0.8	0.8	0.0	-1.0	-0.5	.0	18.5
13				-3.0	-7.0	-5.0	2.2	23.0
14		0.4	0.4	-6.5	-14.5	-10.5	.9	28.5
15		0.6	0.6	-4.0	-9.0	-6.5	.0	24.5
16				-4.0	-8.0	-6.0	5.5	24.0

DATE	PRECIPITATION(S) R.P mm	S.N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS 18 C
		N						
17		T	T	-12.0	-19.0	-15.5	4.9	33.5
18				-12.5	-20.0	-16.3	9.3	34.3
19				-8.0	-21.0	-14.5	9.5	32.5
20				-7.5	-23.0	-15.3	9.3	33.3
21				-7.5	-22.0	-14.8	9.6	32.8
22				-8.0	-21.0	-14.5	7.6	32.5
23		2.4	2.4	-4.5	-13.0	-8.8	.0	26.8
24		3.2	3.2	-3.0	-7.5	-5.3	.0	23.3
25				-7.0	-10.0	-8.5	8.5	26.5
26				-7.0	-22.5	-14.8	7.2	32.8
27				-3.0	-17.0	-10.0	6.6	28.0
28				0.0	-12.0	-6.0	5.4	24.0
29				2.5	-7.0	-2.3	2.0	20.3
30	T	7.2	7.2	0.5	-6.0	-2.8	.0	20.8
31		T	T	0.5	-2.5	-1.0	4.5	19.0
∴								

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL % DE LA NORMALE	EXTREME
R.P	T	0	
S.N	23.6	110	7.2
P	23.6	133	7.2

TEMPERATURE

	MEAN MOYENNE	DIFF. FROM NORMAL ÉCART À LA NORMALE	EXTREME
MAX	-4.9	-0.1	2.5
MIN	-12.7	2.8	-23.0
MN	-8.8	1.4	

SUNSHINE INSOLATION
DEG DAYS DEG JOURS 18 C

	TOTAL	POSSIBLE	% OF NORMAL % DE LA NORMALE
SUN INSOL	106.2	29	67
DEG DAYS DEG JOURS	831.1		95

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES 0 C	31
RAIN OR DRIZZLE PLUIE OU BRUINE	
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	10
SNOW NEIGE	10
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	
HAIL GRÊLE	
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FREQ DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT	NE	15.9			7		34		9			
MAXIMUM	S	47	09	*		31		18		1		
PEAK POINTE		M										

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
15.5		16.7		15.0		19.9		15.3		8.9		6.9		11.5	
3		29		10		25		17		4		3		9	

TOTAL HOURS 696 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION DURÉES	MAXIMUM AMOUNT mm HAUTEUR MAXIMUM mm 5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL mm CLASSES HEURES DE PLUIE FREQ. PAR CLASSE mm 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0 +
AMOUNT HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN MOYENNE QUOTIDIENNE WIND RUN km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm

EXPLANATION OF CODES/EXPLICATION DES CODES

R.P RAINFALL PLUIE
S.N SNOWFALL NEIGE
P PRECIPITATIONS
N SNOW GAUGE NIVOMÈTRE
∴ SNOW ON GROUND NEIGE AU SOL cm
• LESS THAN 0.5 h INFÉRIEUR À 0.5 h
* DATA MISSING FOR ONE OR MORE DAYS VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P SUNSHINE INSOLATION POLAR NIGHT
• FIRST OF SEVERAL PREMIER DE PLUSIEURS
M MISSING MANQUANTE
E ESTIMATE ESTIMATION
T TRACE

MONTHLY RECORD
RÉSUMÉ MENSUEL

APR 1983 AVR

4055085 MELFORT CDA

SASK / SASK

LAT 52° 49 'N LONG 104° 36 'W ALT 480 m

REF 007.E09

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	PRECIPITATION(S) S/N cm	PRECIPITATION(S) P mm	TEMPERATURE °C MAX	TEMPERATURE °C MIN	TEMPERATURE °C MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18 C
		N						
1				2.0	-15.0	-6.5	8.6	24.5
2				0.0	-12.5	-6.3	11.2	24.3
3				2.0	-13.5	-5.8	10.5	23.8
4				4.0	-6.0	-1.0	11.2	19.0
5				4.5	-7.5	-1.5	10.3	19.5
6				6.0	-4.0	1.0	11.0	17.0
7				8.5	-2.0	3.3	9.2	14.7
8				7.0	1.0	4.0	3.0	14.0
9				1.0	-4.0	-1.5	7.1	19.5
10	T	12.7	12.7	-5.0	-9.5	-7.3	.0	25.3
11		0.2	0.2	-6.0	-8.0	-7.0	1.6	25.0
12				-7.5	-20.5	-14.0	10.2	32.0
13		T	T	-0.5	-18.0	-9.3	10.0	27.3
14				4.0	-5.5	-0.8	5.6	18.8
15		T	T	-3.0	-5.5	-4.3	4.9	22.3
16		1.0	1.0	-1.0	-7.5	-4.3	.1	22.3

DATE	PRECIPITATION(S) R/P mm	PRECIPITATION(S) S/N cm	PRECIPITATION(S) P mm	TEMPERATURE °C MAX	TEMPERATURE °C MIN	TEMPERATURE °C MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18 C
		N						
17				4.0	-2.5	0.8	.0	17.2
18				5.5	-1.5	2.0	8.6	16.0
19				12.0	0.5	6.3	11.1	11.7
20				15.0	0.0	7.5	11.1	10.5
21				14.0	1.0	7.5	11.5	10.5
22				18.0	2.0	10.0	12.4	8.0
23				22.0	4.0	13.0	9.4	5.0
24				22.0	5.0	13.5	9.5	4.5
25	7.9	8.1	16.0	9.0	3.0	6.0	.1	12.0
26		3.8	3.8	-0.5	-1.5	-1.0	.0	19.0
27		2.0	2.0	-2.5	-4.5	-3.5	.4	21.5
28				1.5	-7.0	-2.8	7.7	20.8
29				4.0	-7.5	-1.8	12.0	19.8
30				10.0	-4.0	3.0	10.5	15.0
31								
∴		T						

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF DE LA NORMALE	EXTREMES
R/P	7.9	77	7.9
S/N	27.8	284	12.7
P	35.7	189	16.0

TEMPERATURE

	MEAN MOY	C FROM DE LA NORMALE	EXTREMES
MAX	5.0	-2.0	22.0
MIN	-5.0	-1.0	-20.5
MN	0.0	-1.3	

SUNSHINE INSOLATION
DEG-DAYS/DEG-JOURS < 18° C

	TOTAL	% POSSIBLE	% OF DE LA NORMALE
SUN/INSOL	218.8	52	105
DEG-DYS/JRS	540.8		108

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES ≤ 0 C	23
RAIN OR DRIZZLE/PLUIE OU BRUINE	1
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	6
SNOW/NEIGE	6
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	1
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE
PREVAILING/DOMINANT	SE	15.6	
MAXIMUM PEAK/POINTE	SW	37 M	08

PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h

0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
*	7	32	34	16	11			

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Mean speed	18.0		20.7		9.4		17.0		14.8		11.5		9.0		16.7	
% frequency	5		11		4		28		26		10		5		11	

TOTAL HOURS 720 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT/HAUTEUR									
DATE(S)									

HOURS OF RAINFALL - mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-47.9	50.0+

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
S/N - SNOWFALL/NEIGE
* - DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P - PRECIPITATION(S)
N - SNOW GAUGE/NIVOMÈTRE
∴ - SNOW ON GROUND/NEIGE AU SOL (cm)
* - LESS THAN 0.5%/INFÉRIEURE À 0.5%
P - SUNSHINE/INSOLATION - POLAR NIGHT/NUIT POLAIRE
* - FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M - MISSING/MANQUANTE
E - ESTIMATE/ESTIMATIVE
SVS - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ
T - TRACE

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TEMPERATURE CHECK LISTING FOR AREAS  I

 MAY                            1983                  LISTING OF MAXIMUM(C ) TEMPE
STATION NAME                 1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17

REEN LAKE          3380 02  -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999
  54 17 N  107 48 W
BIG RIVER           720 06  -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999
  53 50 N  107  2 W
STURGEON CROSSIN 8350 10      65  125   90  140  100  130  220  175   75   35  130  165  130   70  135  190  200
  53 44 N  106 43 W
HENRIBOURG         3700 08    80  105   65  145  100  120  195  140  120  -20   45  100  110   20  100  165  180
  53 26 N  105 35 W
FOXFORD            2920 07    95  105   70  150   90  105  195  150  155  -25   50   70  110   35   90  160  180
  53 25 N  105  7 W
SPIRITWOOD         8070 05    40  135   75  130  120  110  190  185   60   45  105  150  125   70  115  180  170
  53 22 N  107 31 W
CAN D              1140 01    80  120   90  155  115  110  210  170  120   10   70  130  140   50  110  175  195
  53 17 N  106 32 W
LOST RIVER         4720 08   110  110   70  155   80  105  195  160  175  -25   45   80  125   40   95  165  185
  53 17 N  104 20 W
ETHELTON           2620 07   110  120   90  150  120  115  200  115  170  -30   15   55  110   40   90  165  180
  52 46 N  104 56 W
MELFORT CDA        5200 08   105  115   65  145  115  110  195  185  170  -30   15   50  100   20   80  155  170
  52 49 N  104 36 W

MEANS                         85  116   76  146  105  113  200  160  130   -5   59  100  118   43  101  169  185
STANDARD DEV                  24   10   11    8   14    8   10   24   44   30   40   43   13   19   17   11    9

                                              -99.9 = missing
 MAY                            1983                  LISTING OF MINIMUM(C ) TEMPE

GREEN LAKE         3380 02  -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888
  54 17 N  107 48 W
BIG RIVER           720 06  -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888 -888
  53 50 N  107  2 W
STURGEON CROSSIN 8350 10      35  -30  -20    0   10    0   30   70   30  -20  -85  -60  -20  -20  -60   35   20
  53 44 N  106 43 W
HENRIBOURG         3700 08    30  -30  -10    0    0   -5   15   65   40  -30 -100  -50  -25  -10  -30   30   25
  53 26 N  105 35 W
FOXFORD            2920 07    30   20   -5  -10   -5  -10   -5   55   45  -35 -135  -80  -20  -15  -30    0   20
  53 25 N  105  7 W
SPIRITWOOD         8070 05    15  -25  -40   20    0   -5   40   55   30  -25  -60  -50   -5  -20  -35  -10   20
  53 22 N  107 31 W
CA EO              1140 01    30   -5  -10   30    5    0   30   65   50  -25 -115  -55  -15  -15  -55   35   10
  53 17 N  106 32 W
LOST RIVER         4720 08    30   30    5   10  -10    0    0   85   35  -55  -90  -45   10  -25  -45   30   40
  53 17 N  104 20 W
ETHELTON           2620 07    10   10  -50   10  -40    0  -10   70   40  -55 -110  -80    0  -10  -60   10   20
  52 46 N  104 56 W
MELFORT CDA        5200 08    10   20   -5   10  -20    5   10   70   50  -55  -05  -50    0  -10  -50   10   40
  52 49 N  104 36 W

MEANS                         23   -1  -16    8   -7   -1   13   66   40  -37  -97  -53   -9  -15  -45   17   24
STANDARD DEV                  10   24   18   12   16    4   18    9    8   15   22   13   12    5   12   17   10

 - INDICATES VALUES WHICH ARE MORE THAN 2.0 TIMES THE STANDARD DEVIATION AWAY FROM THE MEAN    ** NOTE ** ALL

                                         -77.7 = missing data assumed below freezing    -88.8 = missing
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ERATURES

18	19	20	21	22	23	24	25	26	27	28	29	30	31
145	165	115	155	115	85	165	270	220	220	210	215	160	160
155	170	140	140	120	75	165	265	230	220	200	215	170	175
155	180	145	140	130	90	170	280	235	225	210	215	185	175
160	155	140	145	120	90	150	250	260	220	215	185	170	180
175	155	160	150	130	100	155	245	265	230	215	200	180	190
155	160	140	145	120	65	160	265	235	215	200	215	165	170
100	170	165	155	125	85	160	270	260	235	220	240	185	185
105	145	165	150	135	100	150	255	270	230	215	190	180	190
175	170	170	140	135	95	160	250	265	230	200	225	175	190
175	165	165	130	135	90	145	250	265	225	200	200	175	185
166	163	150	145	126	87	158	260	250	225	208	210	174	180
13	10	17	7	7	10	7	11	18	6	7	16	8	10

ERATURES

-888	0	25	55	35	5	-20	40	50	40	-10	80	0	35
-888	5	35	60	40	20	-45	20	75	75	20	110	15	40
55	-10	5	60	0	15	-60	70	80	20	-20	40	10	20
60	0	55	65	35	30	-20	60	95	90	20	100	25	35
50	-10	45	50	20	30	-30	35	85	105	35	75	50	45
45	10	40	55	50	5	-20	85	85	65	20	50	5	45
60	-5	30	65	5	20	-55	70	110	70	-5	60	-10	5
90	-15	85	65	15	35	-50	20	105	120	30	30	40	30
80	-20	80	55	40	10	-30	60	85	100	40	-888	5	35
80	-5	75	50	35	25	-25	55	100	110	50	45	15	45
65	-5	47	58	27	19	-35	51	87	79	18	65	15	33
16	9	26	5	16	10	15	21	17	31	22	27	18	12

L FIGURES INCLUDE 1 IMPLIED DECIMAL PLACE

] data assumed above freezing

MONTHLY RECORD
RÉSUMÉ MENSUEL

JUN 1983 JUIN

4055085 BELFORT CDA SASK / SASK

LAT52 °49 'N LONG104 °36 'W ALT 480 m

HI 007.109

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R.P mm	S.N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS <18 C
1	3.6		3.6	22.5	9.5	16.0	.3	2.0
2	2.6		2.6	14.0	7.5	10.8	2.2	7.2
3	5.5		5.5	7.0	5.0	6.0	.0	12.0
4	0.2		0.2	13.5	5.0	9.3	2.2	8.7
5				19.0	5.0	12.0	13.3	6.0
6				23.5	6.0	14.8	14.2	3.2
7	3.4		3.4	20.0	10.5	15.3	5.8	2.7
8	T		T	23.5	7.5	15.5	11.7	2.5
9	T		T	28.5	12.0	20.3	5.3	
10	T		T	30.5	10.0	20.3	11.4	
11				25.5	16.0	20.8	6.1	
12	12.7		12.7	12.5	11.0	11.8	.0	6.2
13	4.6		4.6	19.5	8.0	13.8	11.7	4.2
14	1.8		1.8	16.5	9.0	12.8	2.1	5.2
15				17.5	4.5	11.0	14.3	7.0
16				25.0	6.5	15.8	14.8	2.2

DATE	PRECIPITATION(S) R.P mm	S.N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS <18 C
17				28.0	12.0	20.0	13.9	
18	4.7		4.7	25.0	15.5	20.3	10.4	
19				23.5	10.5	17.0	12.7	1.0
20				23.0	9.5	16.3	13.4	1.7
21	T		T	22.0	9.0	15.5	8.6	2.5
22	1.2		1.2	21.5	9.0	15.3	4.4	2.7
23				22.5	6.5	14.5	8.0	3.5
24				27.5	15.0	21.3	5.3	
25	0.6		0.6	22.5	15.5	19.0	6.2	
26				15.0	7.0	11.0	1.1	7.0
27				19.5	4.5	12.0	4.5	6.0
28				25.0	8.0	16.5	9.8	1.5
29				26.0	13.5	19.8	2.7	
30	1.2		1.2	24.5	13.0	18.8	5.2	
31								
∴		0						

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL	EXTREME
R.P	42.1	59	12.7
S.N	0.0	100	
P	42.1	59	12.7

TEMPERATURE

	MEAN MOY.	DIFF. FROM NORMAL	EXTREME
MAX	21.5	-0.3	30.5
MIN	9.4	0.7	4.5
MN	15.5	0.2	

SUNSHINE INSOLATION DEG DAYS DEG JOURS 18 C

	TOTAL	% OF NORMAL	[illegible]
SUN INSOL.	221.6	44	84
DEG. DAYS	95.0		98

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	
RAIN OR DRIZZLE PLUIE OU BRUINE	12
MEASURABLE PRECIPITATION PRECIPITATIONS MESURABLES	12
SNOW NEIGE	
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRECIPITATIONS SE CONGELANT	
HAIL GRÊLE	
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING DOMINANT	NW	15.7			5		36		8			
MAXIMUM	SE	48	18	•		33		16		2		
PEAK POINTE		H										

MEAN SPEED IN km/h · PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h · FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
km/h	10.5		15.8		10.9		16.6		18.4		17.6		8.7		15.2	
%	4		11		5		18		22		12		5		23	

TOTAL HOURS 720 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAIN BY CLASS HEURES DE PLUIE PAR CLASSE 0.2-3.9	4.0-4.9	5.0-12.9	13.0-24.9	25.0 +
AMOUNT HAUTEUR	1.0	1.5	1.9	2.8	4.1	6.0	9.6	12.7	19.2	62	1			
DATES	12	12	12	12	12	12	12	12	12					

EVAPORATION

WATER LOSS PERTE D'EAU mm	DAILY MEAN MOYENNE QUOTIDIENNE WIND km	WATER TEMPERATURE °C	AIR TEMPERATURE °C	[illegible]
199.7	205	16.7	15.5	144.°

EXPLANATION OF CODES/EXPLICATION DES CODES

R.P [illegible]
S.N [illegible]
P [illegible]

MONTHLY RECORD
RÉSUMÉ MENSUEL

JUL 1983 JUIL

4055085 MELFORT CDA

SASK / SASK

REF 007.009

LAT 52° 49' N LONG 104° 36' W ALT 450 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS-JOURS < 18°C
		N						
1	14.2		14.2	22.0	13.0	17.5	4.8	.5
2	42.6		42.6	20.0	12.0	16.0	1.7	2.0
3	6.6		6.6	18.0	14.0	16.0	.4	2.0
4	0.5		0.5	14.0	7.0	10.5	3.8	7.5
5				23.5	6.0	14.8	9.4	3.2
6				29.0	11.0	20.0	13.0	
7				27.5	16.5	22.0	11.5	
8	17.7		17.7	21.5	13.0	17.3	1.8	.7
9				26.5	17.0	21.8	9.2	
10	11.6		11.6	17.0	14.0	15.5	.0	2.5
11				23.5	11.0	17.3	12.6	.7
12				26.5	14.0	20.3	8.3	
13	0.6		0.6	24.5	14.0	19.3	12.5	
14	6.8		6.8	28.5	17.0	22.8	7.2	
15	0.2		0.2	20.0	13.0	16.5	3.8	1.5
16	0.4		0.4	22.5	12.5	17.5	8.9	.5

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS-JOURS < 18°C
		N						
17				22.5	10.0	16.3	12.9	1.7
18	T		T	23.5	8.5	16.0	14.3	2.0
19				28.0	12.5	20.3	13.6	
20	9.2		9.2	25.0	15.0	20.0	1.4	
21	0.4		0.4	24.5	14.5	19.5	10.3	
22				21.0	15.0	18.0	5.1	
23				25.5	10.0	17.8	13.5	.2
24	10.0		10.0	26.0	13.0	19.5	5.8	
25	0.7		0.7	27.5	16.5	22.0	7.5	
26				26.5	17.5	22.0	12.1	
27				24.0	11.0	17.5	12.4	.5
28	T		T	22.5	12.0	17.3	3.0	.7
29	4.5		4.5	24.0	12.0	18.0	6.2	
30				24.0	13.0	18.5	14.1	
31				26.5	13.5	20.0	14.5	
∴		0						

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL	% OF NORMAL % DE LA NORMALE	EXTREME
R/P	126.0	196	42.6
S/N	0.0	100	
P	126.0	196	42.6

TEMPERATURE

	MEAN MOY	DIFF. FROM NORMAL / DE LA NORMALE	EXTREMES
MAX	23.7	-0.1	29.0
MIN	12.9	2.0	6.0
MN	18.3	0.9	

SUNSHINE INSOLATION
DEG DAYS DEG-JOURS < 18 C

	TOTAL	% POSSIBLE	% OF NORMAL % DE LA NORMALE
SUN INSOL	254.4	50	84
DEG JOURS	26.2		52

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ < 1	1-10	> 10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	
RAIN OR DRIZZLE/PLUIE OU BRUINE	15
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	15
SNOW/NEIGE	
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h

	DIRECTION	SPEED VITESSE km/h	DATE	0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	> 61
PREVAILING/DOMINANT	M	13.5			M		M		M		M	
MAXIMUM PEAK/POINTE	SE	48 M	21	M		M		M		M		M

MEAN SPEED IN km/h · PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h · FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

TOTAL HOURS 618 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT HAUTEUR	5.0	8.4	11.7	13.1	13.6	16.2	30.4	40.4	45.4
DATES	1	1	1	1	1	2	2	3	2

HOURS OF RAINFALL BY CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0 +
57	9	6			

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	[illegible]
178.4	179	20.2	18.3	135.1

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P RAINFALL/PLUIE
S/N SNOWFALL/NEIGE
P PRECIPITATION(S)
N [illegible]
∴ SNOW ON GROUND/NEIGE AU SOL (cm)
• LESS THAN 0.5%/INFÉRIEUR À 0.5%
• FIRST OF SEVERAL [illegible]
M MISSING/MANQUANTE
SSE SEVERAL [illegible]
U [illegible]
• [illegible]
E ESTIMATED [illegible]

MONTHLY RECORD
RÉSUMÉ MENSUEL

AUG 1983 AOUT

4055085 MELFORT CDA SASK / SASK

LAT 52° 49'N LONG 104° 36'W ALT 480 m

PLI 007.F09

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS-JOURS < 18°C
		N						
1	0.8		0.8	28.0	13.0	20.5	5.0	
2				31.0	16.5	23.8	14.0	
3				34.0	18.0	26.0	14.9	
4				30.0	19.0	24.5	12.0	
5				28.5	10.5	19.5	14.5	
6	T		T	33.0	17.0	25.0	12.7	
7				25.0	18.0	21.5	11.8	
8				26.5	11.0	18.8	8.9	
9				29.5	17.0	23.3	10.1	
10				27.5	9.5	18.5	13.9	
11	6.2		6.2	30.5	11.0	20.8	12.4	
12	29.2		29.2	24.0	17.5	20.8	2.9	
13				25.5	11.5	18.5	13.7	
14				30.0	14.5	22.3	12.0	
15	1.6		1.6	24.0	10.0	17.0	12.5	1.0
16				26.0	11.5	18.8	13.0	

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS-JOURS < 18°C
		N						
17	0.8		0.8	25.0	13.0	19.0	12.7	
18	6.2		6.2	21.5	13.5	17.5	4.1	.5
19				19.5	7.0	13.3	13.6	4.7
20				23.5	9.5	16.5	3.9	1.5
21				23.0	9.0	16.0	13.7	2.0
22				24.5	7.0	15.8	13.3	2.2
23				25.5	11.5	18.5	10.5	
24	22.6		22.6	27.0	10.5	18.2	8.0	
25				25.0	10.5	17.8	8.9	.2
26	10.4		10.4	26.5	12.5	19.5	10.6	
27				31.0	11.5	21.3	12.7	
28	0.2		0.2	26.5	10.0	18.3	9.8	
29				28.0	15.0	21.5	12.2	
30				30.0	12.0	21.0	10.5	
31				34.5	14.0	24.3	9.6	
∴		0						

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATION(S)	TOTAL	% OF NORMAL % DE LA NORMALE	EXTREMES
R/P	78.0	143	29.2
S/N	0.0	100	
P	78.0	143	29.2

TEMPERATURE	MEAN MOY	DEPARTURE FROM NORMAL ÉCART À LA NORMALE	EXTREMES
MAX	27.2	4.5	34.5
MIN	12.6	3.2	7.0
MN	19.9	3.8	

SUNSHINE/INSOLATION DEG-DAYS/DEG JOURS < 18°C	TOTAL	POSSIBLE	% OF NORMAL % DE LA NORMALE
SUN INSOL	338.4	74	132
DEG DAYS JRS	12.1		15

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	
RAIN OR DRIZZLE/PLUIE OU BRUINE	9
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	9
SNOW/NEIGE	
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ BY SPEED CLASS FRÉQ DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT	SW	12.0			12	45	32	10	1			
MAXIMUM	SE	37	20									
PEAK/POINTE		M										

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Mean speed	10.4		9.7		7.7		15.1		12.6		11.3		8.3		13.4	
Frequency	3		6		3		17		16		25		11		19	

TOTAL HOURS 694 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT/HAUTEUR #	8.3	16.3	20.5	22.4	25.5	27.7	27.7	29.2	29.2
DATE(S) #	12	12	12	12	12	12	12	12	12

HOURS OF RAINFALL - mm CLASSES / HEURES DE PLUIE PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
17	1	1	1	1	

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC
# 200.5	135	20.3	19.8	M

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
P - PRECIPITATION(S)
∴ - SNOW ON GROUND/NEIGE AU SOL (cm)
♦ - PAST OR SEVERAL ELEMENTS/ÉLÉMENTS DE PLUSIEURS
SVL - SEVERAL/PLUSIEURS
S/N - SNOWFALL/NEIGE
N - SNOW GAUGE/NIVOMÈTRE
* - LESS THAN 0.5%/INFÉRIEUR À 0.5%
M - MISSING/MANQUANTE
U - NOT OBSERVED/NON OBSERVÉ
- DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
♦ - [illegible]
E - ESTIMATE/ESTIMATIVE
T - TRACES

MONTHLY RECORD
RÉSUMÉ MENSUEL

SEP 1983 SEPT

4055085 MELFORT CDA SASK / SASK FL 007.H09

LAT 52 ° 49 ' N LONG 104 ° 36 ' W ALT 480 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	M/N	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉS JOURS < 18°C
		N						
1				30.5	13.5	22.0	8.9	
2	3.0		3.0	22.0	13.5	17.8	2.5	.2
3	2.0		2.0	22.0	12.5	17.3	8.1	.7
4	2.0		2.0	21.5	9.5	15.5	9.6	2.5
5	14.6		14.6	15.5	9.5	12.5	.0	5.5
6	0.4		0.4	17.5	9.5	13.5	3.9	4.5
7				22.0	8.0	15.0	9.3	3.0
8	0.2		0.2	17.5	4.5	11.0	8.4	7.0
9	28.5		28.5	9.5	9.0	9.3	.0	8.7
10				14.0	5.0	9.5	3.7	8.5
11	0.2		0.2	14.5	1.0	7.8	10.4	10.2
12	4.4		4.4	14.0	4.0	9.0	4.1	9.0
13				15.0	0.5	7.8	10.0	10.2
14				15.0	4.0	9.5	4.1	8.5
15				15.5	0.5	8.0	6.6	10.0
16	0.2		0.2	17.0	8.0	12.5	.9	5.5
17	9.1		9.1	8.5	5.0	6.8	.0	11.2
18				4.5	3.5	4.0	.0	14.0
19	0.6		0.6	4.5	0.5	2.5	.0	15.5
20				6.0	-1.5	2.3	1.2	15.7
21				8.0	-3.5	2.3	6.0	15.7
22				13.5	-4.5	4.5	9.2	13.5
23				22.5	2.0	12.3	10.0	5.7
24				16.5	6.0	11.3	3.2	6.7
25				22.0	5.0	13.5	9.0	4.5
26				27.0	7.0	17.0	8.3	1.0
27				19.5	10.5	15.0	6.1	3.0
28				4.0	-0.5	1.8	3.2	16.2
29				10.0	-5.0	2.5	6.4	15.5
30				7.5	-5.0	1.3	3.6	16.7
31								
∴		0						

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION/S

	TOTAL	% OF NORMAL / % DE LA NORMALE	EXTREMES
R/P	65.2	170	28.5
S/N	0.0	0	
P	65.2	160	28.5

TEMPERATURE

	MEAN MOY	DIFF. FROM NORMAL / ÉCART À LA NORMALE	EXTREMES
MAX	15.2	-0.9	30.5
MIN	4.4	0.0	-5.0
M/N	9.8	-0.5	

SUNSHINE/INSOLATION DEG DAYS/DEG JOURS < 18 °C

	TOTAL	[illegible]	[illegible]
SUN/INSOL	156.7	41	94
DEG DAYS/DEG JRS	248.9		105

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	6
RAIN OR DRIZZLE PLUIE OU BRUINE	12
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	12
SNOW NEIGE	
THUNDERSTORMS ORAGES	
FREEZING PRECIPITATION PRÉCIPITATIONS SE CONGELANT	
HAIL GRÊLE	
FOG BROUILLARD	U
SMOKE OR HAZE FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE
PREVAILING/DOMINANT	NW	16.4	
MAXIMUM	NW	43	17
PEAK/POINTE		N	

PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h

0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
•	5	29	37	20	7	2		

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
km/h	8.5		13.4		8.7		16.3		14.8		15.5		10.7		20.2	
%	1		5		1		16		12		29		5		31	

TOTAL HOURS 720 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT/HAUTEUR	10.5	10.5	10.5	10.5	10.5	10.5	14.5	24.5	28.5
DATE(S)	5	5	5	5	5	5	9	9	9

HOURS OF RAINFALL - mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	>50.0
43	4	1			

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE °C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC
# 100.5	189	9.7	9.9	M

EXPLANATION OF CODES EXPLICATION DES CODES

R/P RAINFALL PLUIE
S/N SNOWFALL NEIGE
* DATA MISSING FOR ONE OR MORE DAYS VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P PRECIPITATION(S)
N SNOW GAUGE NIVOMÈTRE
R SUNSHINE INSOLATION
∴ SNOW ON GROUND NEIGE AU SOL (cm)
• LESS THAN 0.5% INFÉRIEUR À 0.5%
+ LAST OF SEVERAL DERNIER DE PLUSIEURS
M MISSING MANQUANTE
SVL SEVERAL PLUSIEURS
U NOT OBSERVED NON OBSERVÉ
E ESTIMATE ESTIMATION
T TRACE

MONTHLY RECORD
RÉSUMÉ MENSUEL

OCT 1983 OCT   4055085   MELFORT CDA   SASK / SASK   REF 007.K09

LAT 52° 49 'N . LONG 104° 36 'W   ALT 480 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS -18 C
		N						
1				6.5	1.0	3.8	.0	14.2
2	0.4		0.4	10.0	4.5	7.3	.2	10.7
3				8.0	4.0	6.0	.0	12.0
4	3.2		3.2	15.0	5.0	10.0	2.9	8.0
5				7.0	1.0	4.0	6.2	14.0
6				8.5	-2.5	3.0	7.4	15.0
7				12.0	1.5	6.8	7.0	11.2
8				15.5	3.0	9.3	9.5	8.7
9				14.0	6.0	10.0	4.1	8.0
10	1.0	1.6	2.6	8.0	3.0	5.5	.6	12.5
11				6.0	-4.0	1.0	5.6	17.0
12				12.5	-5.0	3.8	9.6	14.2
13				13.5	-2.0	5.8	9.4	12.2
14				8.5	-4.0	2.3	5.5	15.7
15	1.4		1.4	12.5	0.5	6.5	2.7	11.5
16				0.5	-2.0	-0.8	.0	18.8

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS -18 C
		N						
17				2.5	-8.5	-3.0	9.6	21.0
18				6.5	-8.0	-0.8	8.7	18.8
19				10.5	-1.0	4.8	9.6	13.2
20				14.5	3.5	9.0	2.5	9.0
21				16.0	-2.5	6.8	6.8	11.2
22	1.0		1.0	17.0	2.0	9.5	3.6	8.5
23	T		T	12.0	1.0	6.5	4.2	11.5
24				8.0	-1.5	3.3	9.0	14.7
25				14.5	-2.5	6.0	8.8	12.0
26				18.5	-2.5	8.0	6.9	10.0
27	T		T	6.0	0.5	3.3	.4	14.7
28				7.0	-3.5	1.8	4.6	16.2
29				11.0	-3.0	4.0	8.8	14.0
30				16.0	-6.0	5.0	8.8	13.0
31	0.6		0.6	14.0	5.5	9.8	7.8	8.2
∴		0						

MONTHLY SUMMARY SOMMAIRE MENSUEL

PRECIPITATION(S)

	TOTAL		% OF NORMAL / % DE LA NORMALE	EXTREMES
R/P	7.6	E	42	3.2
S/N	1.6		19	1.6
P	9.2	E	35	3.2

TEMPERATURE

	MEAN MOY	DIFF. FROM NORMAL / ÉCART DE LA NORMALE	EXTREMES
MAX	10.7	1.2	18.5
MIN	-0.5	0.8	-8.5
MN	5.1	0.9	

SUNSHINE INSOLATION
DEG-DAYS DEG JOURS - 18 C

	TOTAL	% POSSIBLE	% OF NORMAL / % DE LA NORMALE
SUN INSOL	170.8	52	115
DEG DYS JRS	399.7		93

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	16
RAIN OR DRIZZLE PLUIE OU BRUINE	6
MEASURABLE PRECIPITATION PRÉCIPITATIONS MESURABLES	6
SNOW/NEIGE	1
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT	S	15.0		•	6	34	37	17	6	•		
MAXIMUM PEAK/POINTE	S	40 M	09									

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
8.7		10.9		9.8		16.8		20.6		12.3		11.9		15.7	
2		5		7		9		25		24		12		16	

TOTAL HOURS 737 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION/DURÉES	MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm) 5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL - mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm 0.2-2.9	3.0-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0
AMOUNT HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION LAC TOTAL

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
S/N - SNOWFALL/NEIGE
# DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P - PRECIPITATION(S)
N - SNOW GAUGE/NIVOMÈTRE
∴ - SNOW ON GROUND/NEIGE AU SOL (cm)
• - LESS THAN 0.5%/INFÉRIEURE À 0.5%
F - SUNSHINE INSOLATION - POLAR NIGHT/LA NUIT POLAIRE
• - FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M - MISSING/MANQUANTE
E - ESTIMATE/ESTIMATIVE
SVL - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ
T - TRACE

MONTHLY RECORD
RÉSUMÉ MENSUEL

NOV 1983 NOV 4055085 MELFORT CDA SASK / SASK REF 006.E09

LAT 52 ° 49 ' N LONG 104 ° 36 ' W ALT 480 m

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS -18°C
		N						
1	9.4		9.4	3.5	0.0	1.8	.0	16.2
2	1.0		1.0	4.0	-4.0	0.0	3.8	18.0
3	T		T	8.5	0.0	4.3	.3	13.7
4	T		T	12.5	6.5	9.5	.5	8.5
5				8.5	0.5	4.5	8.6	13.5
6	2.4	2.6	5.0	8.5	-4.5	2.0	4.6	16.0
7		T	T	2.5	0.0	1.3	.0	16.7
8		T	T	4.0	-3.5	0.3	.1	17.7
9		1.0	1.0	0.5	-3.5	-1.5	.0	19.5
10				-2.0	-4.0	-3.0	.0	21.0
11		1.5	1.5	-2.0	-4.0	-3.0	.0	21.0
12				0.0	-3.0	-1.5	.0	19.5
13	T		T	-1.0	-1.5	-1.3	.0	19.3
14		T	T	-1.5	-3.5	-2.5	.0	20.5
15				-0.5	-2.5	-1.5	.0	19.5
16				1.5	-2.0	-0.3	.7	18.3

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUNSHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS -18°C
		N						
17	2.2	2.8	5.0	1.5	0.5	1.0	.0	17.0
18		0.4	0.4	-0.5	-1.0	-0.8	.0	18.8
19		3.0	3.0	-2.0	-2.5	-2.3	.0	20.3
20		4.0	4.0	-4.5	-6.0	-5.3	.0	23.3
21		2.4	2.4	-5.5	-6.0	-5.8	.0	23.8
22		2.4	2.4	-6.5	-8.0	-7.3	.8	25.3
23		0.5	0.5	-6.5	-10.5	-9.5	.0	27.5
24		T	T	-11.5	-15.0	-13.3	3.6	31.3
25		0.6	0.6	-9.0	-17.0	-13.0	.0	31.0
26		T	T	-8.0	-12.0	-10.0	.0	28.0
27				-7.0	-18.0	-12.5	2.9	30.5
28		0.2	0.2	-6.5	-12.0	-9.3	.0	27.3
29		T	T	-10.5	-13.5	-12.0	2.3	30.0
30		T	T	-7.5	-14.5	-11.0	.0	29.0
31								
∴								

MONTHLY SUMMARY
SOMMAIRE MENSUEL

PRECIPITATIONS

	TOTAL	% OF DE LA NORMALE	EXTREMES
R/P	15.0	938	9.4
S/N	21.4	114	4.0
P	36.4	193	9.4

TEMPERATURE

	MEAN MOY	C FROM DE LA NORMALE	EXTREMES
MAX	-1.3	1.4	12.5
MIN	-5.5	5.5	-18.0
MN	3.4	3.5	

SUNSHINE/INSOLATION
DEG DAYS/DEG JOURS - 18 C

	TOTAL	POSSIBLE	% OF DE LA NORMALE
SUN/INSOL	26.2	11	34
DEG DYS/JRS	642.0		87

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES > 0 C	27
RAIN OR DRIZZLE/PLUIE OU BRUINE	4
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	14
SNOW/NEIGE	12
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SÈCHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS / FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT	SE	15.2			9		30		9			
MAXIMUM	S	39	03+	1		34		17		*		
PEAK/POINTE		N										

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
12.6		13.9		9.1		20.8		21.7		14.1		8.9		11.6	
13		18		4		23		11		7		6		17	

TOTAL HOURS 720 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

DURATION/DURÉES	MAXIMUM AMOUNT (mm) HAUTEUR MAXIMUM (mm) 5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h	HOURS OF RAINFALL mm CLASSES / HEURES DE PLUIE FRÉQ. PAR CLASSE mm 0.2-2.9	3.3-4.9	5.0-12.9	13.0-24.9	25.0-49.9	50.0+
AMOUNT/HAUTEUR															
DATE(S)															

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P RAINFALL/PLUIE
S/N SNOWFALL/NEIGE
* DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P PRECIPITATIONS
N SNOW GAUGE/NIVOMÈTRE
∴ SNOW ON GROUND/NEIGE AU SOL (cm)
• LESS THAN 0.5%/INFÉRIEURE À 0.5%
F SUNSHINE/INSOLATION: POLAR NIGHT/LA NUIT POLAIRE
+ FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M MISSING/MANQUANTE
E ESTIMATE/ESTIMATIVE
SVL SEVERAL/PLUSIEURS
U NOT OBSERVED/NON OBSERVÉ
T TRACES

MONTHLY RECORD
RÉSUMÉ MENSUEL

DEC 1983 DEC

4055085 MELFORT CDA SASK / SASK

LAT 52° 49 'N LONG 104° 36 'W ALT 480 m

REF. 006.109

DAILY CLIMATE DATA/DONNÉES CLIMATIQUES QUOTIDIENNES

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUN SHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
		N						
1				-11.0	-19.0	-15.0	.3	33.0
2				-14.0	-25.5	-19.8	4.1	37.8
3		0.8	0.8	-12.5	-19.0	-15.8	1.6	33.8
4				-13.0	-20.0	-16.5	5.6	34.5
5		T	T	-10.5	-31.0	-20.8	.0	38.8
6		0.7	0.7	-11.5	-15.5	-13.5	.0	31.5
7		0.4	0.4	-14.0	-24.0	-19.0	2.8	37.0
8				-25.5	-33.0	-29.3	6.5	47.3
9				-22.0	-31.0	-26.5	4.5	44.5
10		2.4	2.4	-19.0	-27.5	-23.3	.0	41.3
11		1.6	1.6	-13.5	-25.5	-19.5	4.6	37.5
12				-13.0	-30.5	-21.8	5.3	39.8
13		0.4	0.4	-14.0	-24.0	-19.0	1.0	37.0
14		1.3	1.3	-20.0	-25.0	-22.5	.0	40.5
15		0.4	0.4	-29.0	-35.0	-32.0	.0	50.0
16				-26.0	-32.5	-29.3	5.4	47.3

DATE	PRECIPITATION(S) R/P mm	S/N cm	P mm	TEMPERATURE °C MAX	MIN	MN	SUN SHINE INSOLATION h	DEGREE DAYS DEGRÉ JOURS < 18°C
		N						
17		0.3	0.3	-27.5	-33.0	-30.3	3.8	48.3
18				-27.0	-32.5	-29.8	5.5	47.8
19				-27.0	-35.0	-31.0	4.5	49.0
20		T	T	-28.5	-33.0	-30.8	.0	48.8
21		0.4	0.4	-31.0	-35.0	-33.0	3.8	51.0
22		T	T	-34.5	-37.0	-35.8	2.4	53.8
23				-30.0	-40.0	-35.0	2.3	53.0
24		1.2	1.2	-14.5	-35.0	-24.8	.0	42.8
25		1.0	1.0	-9.5	-24.0	-16.8	1.0	34.8
26				-12.0	-17.5	-14.8	4.5	32.8
27		T	T	-13.5	-20.0	-16.8	4.7	34.8
28		T	T	-18.5	-25.0	-21.8	4.5	39.8
29				-10.5	-23.0	-16.8	7.1	34.8
30				-19.5	-24.0	-21.8	5.9	39.8
31				-8.0	-27.0	-17.5	.3	35.5
∴								

MONTHLY SUMMARY — SOMMAIRE MENSUEL

PRECIPITATIONS	TOTAL	% OF DE LA NORMALE	EXTREMES
R/F	0.0	0	
S/N	10.9	39	2.4
P	10.9	43	2.4

TEMPERATURE	MEAN MOY	°C FROM DE LA NORMALE	EXTREMES
MAX	-18.7	-5.9	-8.0
MIN	-27.7	-6.6	-40.0
MN	-23.2	-6.7	

SUNSHINE/INSOLATION DEG-DAYS/DEG JOURS < 18° C	TOTAL	% POSSIBLE	% OF DE LA NORMALE
SUN/INSOL	92.0	38	131
DEG-DYS JRS	1278.4		120

SYNOPTICS/SYNOPTIQUES

HOUR HEURE	MEAN/MOYENNE PRESSURE PRESSION kPa STATION	SEA LEVEL NIVEAU DE LA MER	TEMPERATURE °C	DEW POINT POINT DE ROSÉE °C	VAPOUR PRESSURE TENSION DE VAPEUR kPa	NUMBER OF OBSERVATIONS NOMBRE D'OBSERVATIONS CLOUD AMOUNT NÉBULOSITÉ TENTHS/DIXIÈMES 0-2	3-7	8-10	VISIBILITY km VISIBILITÉ <1	1-10	>10

NUMBER OF DAYS WITH/NOMBRE DE JOURS AVEC

TEMPERATURES < 0 C	31
RAIN OR DRIZZLE/PLUIE OU BRUINE	
MEASURABLE PRECIPITATION/PRÉCIPITATIONS MESURABLES	12
SNOW/NEIGE	12
THUNDERSTORMS/ORAGES	
FREEZING PRECIPITATION/PRÉCIPITATIONS SE CONGELANT	
HAIL/GRÊLE	
FOG/BROUILLARD	U
SMOKE OR HAZE/FUMÉE OU BRUME SECHE	U
DUST OR BLOWING SAND/POUSSIÈRE OU CHASSE-SABLE ÉLEVÉE	U
BLOWING SNOW/CHASSE NEIGE ÉLEVÉE	U

WIND/VENT

	DIRECTION	SPEED VITESSE km/h	DATE	PERCENTAGE FREQ. BY SPEED CLASS FRÉQ. DE LA CLASSE DE VITESSE EN POURCENTAGE km/h 0	1-5	6-11	12-19	20-28	29-38	39-49	50-61	>61
PREVAILING/DOMINANT	SW	13.8			6		42		2			
MAXIMUM	NE	32	14+	2		33		15				
PEAK/POINTE		M										

MEAN SPEED IN km/h - PERCENTAGE FREQUENCY BY DIRECTION
VITESSE MOYENNE EN km/h - FRÉQUENCE DE LA DIRECTION EN POURCENTAGE

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
7.0		16.5		12.8		12.2		16.1		14.6		12.3		14.5	
1		6		3		3		8		29		24		24	

TOTAL HOURS 744 TOTAL DES HEURES

RECORDING RAIN GAUGE DATA/DONNÉES DES PLUVIOGRAPHES

MAXIMUM AMOUNT (mm)/HAUTEUR MAXIMUM (mm)

DURATION/DURÉES	5 min	10 min	15 min	30 min	60 min	120 min	6 h	12 h	24 h
AMOUNT/HAUTEUR									
DATE(S)									

HOURS OF RAINFALL - mm CLASSES
HEURES DE PLUIE FRÉQ. PAR CLASSE mm

0.2-29	30-49	50-129	130-249	250-499	500+

EVAPORATION

WATER LOSS mm PERTE D'EAU	DAILY MEAN/MOYENNE QUOTIDIENNE TOTAL WIND RUN PARCOURS DU VENT km	TEMPERATURE C WATER DE L'EAU	AIR DE L'AIR	LAKE EVAPORATION mm ÉVAPORATION DU LAC

EXPLANATION OF CODES/EXPLICATION DES CODES

R/P - RAINFALL/PLUIE
S/N - SNOWFALL/NEIGE
# - DATA MISSING FOR ONE OR MORE DAYS/VALEURS MANQUANTES POUR UN OU PLUSIEURS JOURS
P - PRECIPITATION(S)
N - SNOW GAUGE/NIVOMÈTRE
∴ - SNOW ON GROUND/NEIGE AU SOL (cm)
• - LESS THAN 0.5%/INFÉRIEURE À 0.5%
P - (SUNSHINE/INSOLATION) POLAR NIGHT/LA NUIT POLAIRE
+ - FIRST OF SEVERAL/PREMIER DE PLUSIEURS
M - MISSING/MANQUANTE
E - ESTIMATE/ESTIMATIVE
SVL - SEVERAL/PLUSIEURS
U - NOT OBSERVED/NON OBSERVÉ
T - TRACES

APPENDIX "B"

Natural Gas Main Meter Readings

Humboldt Uniplex

Tisdale Complex

NAME OF COMPLEX: HUMBOLDT

MAIN METER READINGS

PERIOD	cu. m.
January 25 to January 30	1106.6
January 31 to February 6	1064.0
February 7 to February 13	978.3
February 14 to February 20	927.5
February 21 to February 27	769.8
February 28 to March 6 *no reading*	0.0
March 7 to March 13	1614.5
March 14 to March 21	863.4
March 22 to March 27	799.2
March 28 to April 3	711.0
April 4 to April 10	609.4
April 11 to April 17	705.7
April 18 to April 24	267.3
April 25 to May 1	315.4
May 2 to May 8	227.2
May 9 to May 15	261.9
May 17 to May 23	203.1
May 24 to May 29	147.0
May 30 to June 5	195.1
June 6 to June 12	104.2

cont'd.

NAME OF COMPLEX: HUMBOLDT (continued)

MAIN METER READINGS

PERIOD	cu. m.
June 13 to June 26	235.1
June 27 to August 28	1410.7
August 29 to September 11	478.3
September 12 to September 18	585.1
September 19 to September 25	112.2
September 27 to October 2	697.3
October 3 to October 10	697.3
October 11 to October 16	414.1
October 17 to October 23	627.9
October 24 to October 30	579.8
October 31 to November 6	579.8
November 7 to November 13	579.8
November 14 to December 11	3539.1
December 12 to December 18	2475.2
December 19 to January 2	1317.8
January 3 to January 8	1315.1

TOTAL: 27515.4

NAME OF COMPLEX: TISDALE

MAIN METER READINGS

PERIOD	cu. m.
January 25 to January 30	497.2
January 31 to February 6	665.6
February 7 to February 13	580.0
February 14 to February 20	515.9
February 21 to February 27	395.6
February 28 to March 6	430.4
March 7 to March 13	366.2
March 14 to March 21	401.0
March 22 to March 27	272.7
March 28 to April 3	251.3
April 4 to April 10	139.0
April 11 to April 17	237.9
April 18 to April 24 *no reading*	0.0
April 25 to May 1 *no reading*	0.0
May 2 to May 8 *no reading*	0.0
May 9 to May 15 *no reading*	0.0
May 17 to May 23 *no reading*	0.0
May 24 to May 29 *no reading*	0.0
May 30 to June 5 *no reading*	0.0
June 6 to June 14	227.2

cont'd.

NAME OF COMPLEX: TISDALE (continued)

MAIN METER READINGS

PERIOD	cu. m.
June 14 to June 28	26.7
June 29 to August 28	101.6
August 29 to September 11	24.0
September 12 to September 18	13.4
September 19 to September 25	21.4 *
September 26 to October 3	117.6
October 4 to October 12	232.6 **
October 13 to October 16	117.6
October 17 to October 23	200.5
October 24 to October 30	224.5
October 31 to November 6	224.5
November 7 to November 13	312.7
November 14 to December 11	1844.4
December 12 to December 18	719.0
December 19 to January 1	1253.6
January 2 to January 8	400.9
January 9 to January 15	668.3
January 17 to January 21	724.4
January 22 to January 30	548.0
* refrigeration palnt started **curling arena started	
TOTAL:	12755.6

APPENDIX "C"

Individual Meter Readings
Humboldt Complex
Tisdale Complex

HUMBOLDT COMPLEX

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu.m. x 100	kwh
12	M-5	Compressor #1	3791	3845	4481	4540	4573		21230
13	M-6	Compressor #2	3629	3735	4770	4338	4322		20794
15	ET1	Sub-Soil Heating	150	300	300	300	150		1200
28	ET1	Boiler Arena / 80% total	7.41	0	7.41	0	0	14.82	16232
30	ET1	North Make-Up Air	0	0	0	0	5.85	5.84	6417
34	ET1	South Make-Up Air	0	0	0	0	0	0	0
								Gas Elec.	22649 43224
									65873

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
12	M-5	Compressor #1	4821	4862	5248	3327			18258
13	M-6	Compressor #2	4689	4652	3442	3799			16582
15	ET1	Sub-Soil Heating	300	263	188	300			1051
28	ET1	Boiler Arena / 80% total	3.70	7.41	7.41	0		18.52	20290
30	ET1	North Make-Up Air	17.54	23.40	23.40	17.54		81.88	89717
34	ET1	South Make-Up Air	5.86	11.71	5.86			23.43	25667
								Gas	135674
								Elec.	35891
							Total:		171565

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
12	M-5	Compressor #1	5655	4232	0	0			9887
13	M-6	Compressor #2	2657	4823	0	0			7480
15	ET1	Sub-Soil Heating	300	225	0	0			525
28	ET1	Boiler Arena / 80% total	0	0	0	0		0	0
30	ET1	North Make-Up Air	29.25	5.86	31.55	17.54		84.20	92266
34	ET1	South Make-Up Air	17.54	17.54	11.71	5.86		52.65	57692
								Gas Elec.	149958 17892
							Total:		167850

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 5 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
12	M-5	Compressor #1	0	0	0	0	0		0
13	M-6	Compressor #2	0	0	0	0	0		0
15	ET1	Sub-Soil Heating	0	0	0	0	0		0
28	ET1	Boiler Arena / 80% total	0	0	0	0	0		0
30	ET1	North Make-Up Air	0	0	0	0	0		0
34	ET1	South Make-Up Air	0	0	0	0	0		0
								Gas Elec.	0 0
							Total:		0

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 12	Jun 13 Jun 27	Jun 27 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
12	M-5	Compressor #1	0	0	0	27587	12315		39902
13	M-6	Compressor #2	0	0	0	22408	10675		33083
15	ET1	Sub-Soil Heating	0	0	0	375	450		825
28	ET1	Boiler Arena / 80% total	0	0	0	7.41	3.70	11.11	12174
30	ET1	North Make-Up Air	0	0	0	0	0		0
34	ET1	South Make-Up Air	0	0	0	0	0	0	0
								Gas Elec.	12174 74810
							Total:		85984

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 12 Sept 18	Sept 19 Sept 25	Sept 20 Oct 2	Oct 3 Oct 10	Oct 11 Oct 16	cu.m. x 100	kwh
12	M-5	Compressor #1	3308	913	2109	10506	12465		29301
13	M-6	Compressor #2	6100	4576	3800	7360	7121		28957
15	ET1	Sub-Soil Heating	300	0	375	375	225		1275
28	ET1	Boiler Arena / 80% total	3.70	0	0	11.11	0	14.81	17232
30	ET1	North Make-Up Air	0	0	11.71	0	0	11.71	12833
34	ET1	South Make-Up Air	0	0	5.85	0	5.85	11.70	12833
								Gas	41898
								Elec.	59533
							Total:		101431

NAME OF COMPLEX: HUMBOLDT

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
12	M-5	Compressor #1	5050	8930	5620	3117	23203		45920
13	M-6	Compressor #2	3950	8840	2601	5340	14736		35467
15	ET1	Sub-Soil Heating	225	338	225	263	938		1989
28	ET1	Boiler Arena / 80% total	3.70	0	7.40	0	55.55	66.65	73045
30	ET1	North Make-Up Air	0	0	0	0	11.71	11.71	12833
34	ET1	South Make-Up Air	5.80	0	23.42	11.68	11.68	52.58	57618
								Gas	172305
								Elec.	83376
							Total:		198063

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu.m. x 100	kwh
11	M-4	Compressor	2100	3716	2187	3192	3288		14483
16	ET1	Freon Pump	560	1120	1400	840	560		4480
19	ET1	Storage Room Electric	188	262	300	300	150		1200
20	ET1	Entry Electric Heat	1200	900	1500	900	950		5450
28	ET1	Boiler - Curling / 20% total	1.84	0	1.84	0	0	3.68	4043
31	ET1	Roof Top West	4.38	2.19	2.19	4.38	0	13.14	14416
32	ET1	Roof Top Centre	11.71	0	17.54	17.54	0	46.79	51275
33	ET1	Roof Top East	17.54	17.54	5.86	5.86	11.71	58.51	64108
								Gas Elec.	133842 25613
							Total:		159455

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
11	M-4	Compressor	3110	3986	1811	2721			11628
16	ET1	Freon Pump	1120	1400	840	1120			4480
19	ET1	Storage Room Electric	300	300	150	375			1125
20	ET1	Entry Electric Heat	300	950	1200	1350			3800
28	ET1	Boiler Curling / 20% total	0.94	1.84	1.84	0		4.62	5069
31	ET1	Roof Top West	4.38	0	2.19	2.19		8.76	9610
32	ET1	Roof Top Centre	8.77	2.91	5.86	5.86		23.40	25638
33	ET1	Roof Top East	5.86	23.39	5.86	11.71		46.82	51304
								Gas Elec.	91621 21033
							Total:		112654

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
11	M-4	Compressor	294	2	0	2			298
16	ET1	Freon Pump	980	980	840	840			3640
19	ET1	Storage Room Electric	113	38	0	75			226
20	ET1	Entry Electric Heat	900	150	0	0			1050
28	ET1	Boiler Curling / 20% total	0	0	0	0		0	0
31	ET1	Roof Top West	0	0	0	0		0	0
32	ET1	Roof Top Centre	0	11.71	0	0		11.71	12833
33	ET1	Roof Top East	2.91	2.91	2.91	0		8.73	9581
								Gas Elec.	22414 5214
							Total:		27628

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
11	M-4	Compressor	0	0	0	0	0		0
16	ET1	Freon Pump	0	0	0	0	0		0
19	ET1	Storage Room Electric	0	0	0	0	0		0
20	ET1	Entry Electric Heat	0	0	0	0	0		0
28	ET1	Boiler Curling / 20% total	0	0	0	0	0		0
31	ET1	Roof Top West	0	0	0	0	0		0
32	ET1	Roof Top Centre	0	0	0	0	0		0
33	ET1	Roof Top East	0	0	0	0	0		0
								Gas	0
								Elec.	0
							Total:		0

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 26	Jun 27 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
11	M-4	Compressor	0	0	0	0	0		0
16	ET1	Freon Pump	0	0	0	0	0		0
19	ET1	Storage Room Electric	0	0	0	0	300		300
20	ET1	Entry Electric Heat	0	0	0	0	0		0
28	ET1	Boiler Curling / 20% total	0	0	0	1.84	0.92	2.76	3033
31	ET1	Roof Top West	0	0	0	0	0		0
32	ET1	Roof Top Centre	0	0	0	0	0		0
33	ET1	Roof Top East	0	0	0	0	0		0
								Gas Elec.	3033 300
							Total:		3333

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 12 Sept 18	Sept 19 Sept 25	Sept 26 Oct 2	Oct 3 Oct 10	Oct 11 Oct 16	cu.m. x 100	kwh
11	M-4	Compressor	0	0	0	0	756		756
16	ET1	Freon Pump	0	0	0	2520	280		2800
19	ET1	Storage Room Electric	0	0	0	0	0		0
20	ET1	Entry Electric Heat	0	600	300	900	0		1800
28	ET1	Boiler Curling / 20% total	3450	0	0	10350	0		13800
31	ET1	Roof Top West	0	0	0	49200	0		49200
32	ET1	Roof Top Centre	0	0	0	43800	0		43800
33	ET1	Roof Top East	0	0	0	65550	0		65550
								Gas	172350
								Elec.	5356
							Total:		177706

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 32 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
11	M-4	Compressor	974	5026	1850	2267	9200		19317
16	ET1	Freon Pump	840	1120	1120	560	4900		8540
19	ET1	Storage Room Electric	0	0	0	0	0		0
20	ET1	Entry Electric Heat	0	0	0	0	4500		4500
28	ET1	Boiler Curling / 20% total	0.92	0	1.84	0	13.84	16.60	18195
31	ET1	Roof Top West	8.77	0	0	0	13.15	21.92	24026
32	ET1	Roof Top Centre	0	0	0	0	17.57	17.57	19250
33	ET1	Roof Top East	11.68	0	0	0	11.68	23.36	25608
								Gas Elec.	87079 32357
							Total:		119436

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan. 31 Feb. 6	Feb. 7 Feb. 13	Feb. 14 Feb. 20	Feb. 21 Feb. 27	cu.m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	750	1050	0	600	600		3000
2	ET1	Hall Rear Entrance Electric Heat	450	450	450	450	0		1800
3	ET1	Washroom Electric Heat	38	0	38	0	0		76
4	ET1	Club Room Electric Heat	450	450	600	300	825		2625
6	ET1	Kitchen Rear Entrance Electric Heat	450	113	113	225	0		901
7	ET1	Kitchen Staff Washroom Electric Heat	188	263	75	0	75		601
8	ET1	Gen. Room Electric Heat	975	975	1300	1300	650		5200
9	ET1	Mezzanine Electric Heat	100	0	0	0	0		100
10	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
21	ET1	Sprinkler Room Electric Heat	900	900	900	900	600		4200
22	ET1	Secretary's Office Electric Heat	525	525	700	700	350		2800
							cont.d		

NAME OF COMPLEX: HUMBOLDT

AREA: CURLING

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
11	M-4	Compressor	974	5026	1850	2267	9200		19317
16	ET1	Freon Pump	840	1120	1120	560	4900		8540
19	ET1	Storage Room Electric	0	0	0	0	0		0
20	ET1	Entry Electric Heat	0	0	0	0	4500		4500
28	ET1	Boiler Curling / 20% total	0.92	0	1.84	0	13.83	16.59	18195
31	ET1	Roof Top West	8.77	0	0	0	13.15	21.92	24026
32	ET1	Roof Top Centre	0	0	0	0	17.57	17.57	19250
33	ET1	Roof Top East	11.68	0	0	0	11.68	23.36	25608
								Gas	87079
								Elec.	32357
							Total:		119436

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu. m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	600	300	300	600			1800
2	ET1	Hall Rear Entrance Electric Heat	340	110	0	340			790
3	ET1	Washroom Electric Heat	0	38	38	38			114
4	ET1	Club Room Electric Heat	675	450	375	600			2100
6	ET1	Kitchen Rear Entrance Electric Heat	113	0	0	0			113
7	ET1	Kitchen Staff Washroom Electric Heat	0	0	150	0			150
8	ET1	Gen. Room Electric Heat	1300	1300	1300	488			4388
9	ET1	Mezzanine Electric Heat	0	0	0	0			0
10	ET1	Mezzanine Electric Heat	0	0	0	0			0
21	ET1	Sprinkler Room Electric Heat	1050	450	600	1200			3300
22	ET1	Secretary's Office Electric Heat	613	700	700	438			2451
								cont'd.	15206

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu.m. x 100	kwh
23	ET1	Furnace North	1.97	1.97	3.95	0.66	0.66	9.21	10097
24	ET1	Furnace South	2.19	4.38	2.19	0	0	8.76	9610
25	ET1	Boiler #1	18.52	18.52	46.29	27.77	0	111.10	121744
26	ET1	Boiler #2	13.53	13.53	27.05	0	0	54.11	59303
27	ET1	Boiler #3	3.38	0	3.38	0	0	6.76	7413
29	ET1	Kitchen Exhaust	14	42	56	42	14		168
29	Inter-locked with Kitchen Exhaust	Make-Up Air	1.28	3.85	5.12	3.85	1.28	15.38	16862
								Gas Elec.	225029 21471
								Total:	246500

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
23	ET1	Furnace North	1.97	1.97	0.65	2.63		7.22	7934
24	ET1	Furnace South	0.54	0.54	1.09	0		2.17	2403
25	ET1	Boiler #1	46.28	37.03	18.51	37.03		138.85	152178
26	ET1	Boiler #2	16.91	6.76	3.38	3.38		30.43	33358
27	ET1	Boiler #3	0	0	0	0		0	0
29	ET1	Kitchen Exhaust	28	0	0	56		0	84
29	Inter-locked with Kitchen Exhaust	Make-Up Air	2.56	0	0	5.12		7.68	8424
								Gas Elec.	204297 15290
								Total:	219587

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	600	0	600	0			1200
2	ET1	Hall Rear Entrance Electric Heat	225	0	225	0			450
3	ET1	Washroom Electric Heat	0	0	0	0			0
4	ET1	Club Room Electric Heat	600	300	0	0			900
6	ET1	Kitchen Rear Entrance Electric Heat	0	0	0	0			0
7	ET1	Kitchen Staff Washroom Electric Heat	0	0	0	0			0
8	ET1	Gen. Room Electric Heat	975	1138	1463	1138			4714
9	ET1	Mezzanine Electric Heat	0	0	0	0			0
10	ET1	Mezzanine Electric Heat	0	0	0	0			0
21	ET1	Sprinkler Room Electric Heat	600	600	900	600			2700
22	ET1	Secretary's Office Electric Heat	613	700	350	1138			2801
								cont'd.	12765

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION .	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
23	ET1	Furnace North	1.32	0	1.32	1.32		3.96	4325
24	ET1	Furnace South	0	0	2.19	1.10		3.29	3604
25	ET1	Boiler #1	23.14	27.77	23.14	18.52		92.57	101451
26	ET1	Boiler #2	0	3.38	3.38	3.38		10.14	11119
27	ET1	Boiler #3	0	0	0	0		0	0
29	ET1	Kitchen Exhaust	0	28	0	0			28
29	Inter-locked with Kitchen Exhaust	Make-Up Air	0	2.57	0	0		2.57	2813
								Gas Elec.	123312 12793
								Total:	136105

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	300	300	0	0	750		1350
2	ET1	Hall Rear Entrance Electric Heat	110	0	0	0	0		110
3	ET1	Washroom Electric Heat	0	0	0	0	0		0
4	ET1	Club Room Electric Heat	0	0	0	0	75		75
6	ET1	Kitchen Rear Entrance Electric Heat	0	0	0	0	0		0
7	ET1	Kitchen Staff Washroom Electric Heat	0	0	0	0	0		0
8	ET1	Gen. Room Electric Heat	488	488	0	0	0		976
9	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
10	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
21	ET1	Sprinkler Room Electric Heat	300	600	0	600	150		1650
22	ET1	Secretary's Office Electric Heat	263	525	525	700	175		2188
								cont'd.	6349

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
23	ET1	Furnace North	0	0	1.32	0	0	1.32	1442
24	ET1	Furnace South	1.10	2.19	3.29	4.38	0.55	11.51	12614
25	ET1	Boiler #1	0	18.52	18.52	23.14	13.89	74.07	81161
26	ET1	Boiler #2	13.53	13.53	20.29	16.91	6.76	71.02	77835
27	ET1	Boiler #3	0	0	0	0	0	0	0
29	ET1	Kitchen Exhaust	0	28	0	28	28		84
29	Inter-locked with Kitchen Exhaust	Make-Up Air	0	2.57	0	2.57	2.57	7.71	8438
								Gas Elec.	181490 6433
								Total:	187923

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 26	Jun 27 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	0	0	0	450	0		450
2	ET1	Hall Rear Entrance Electric Heat	0	0	0	225	0		225
3	ET1	Washroom Electric Heat	0	0	0	0	0		0
4	ET1	Club Room Electric Heat	0	0	0	0	0		0
6	ET1	Kitchen Rear Entrance Electric Heat	0	0	0	0	0		0
7	ET1	Kitchen Staff Washroom Electric Heat	0	0	0	0	0		0
8	ET1	Gen. Room Electric Heat	0	0	0	650	0		650
9	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
10	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
21	ET1	Sprinkler Room Electric Heat	150	300	0	0	0		450
22	ET1	Secretary's Office Electric Heat	88	88	0	0	0		176
								cont'd.	

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 28	Jun 29 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
41	M-12	Heat Pump #14	0	0	0	0	0		0
53	ET1-26	Electric Heat	0	0	0	0	0		0
BASEMENT AREA									
15	Gas Meter	Make-Up Air #1	0	0	0	0	0		0
44	M-5	Heat Pump #5	0	206	0	0	0		206
50	M-6	Heat Pump #6	0	73	0	0	0		73
51	M-6	Heat Pump #7	0	90	0	0	0		90
SHOOTING RANGE									
28	Gas Meter	Make-Up Air #2	0	0.32	0	0	0	0.32	353
								Gas Elec.	37389 8907
							Total		46296

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 28	Jun 29 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
1	ET1-22	Hot Water Pump #7	0	1232	488	560	840		3080
2	ET1-23	Hot Water Pump #8	0	1580	392	1512	0		3484
5	Gas Meter	Water Heater #1	0	10.72	2.70	9.89	2.67	25.98	28480
7	Gas Meter	Boiler #2	0	7.14	0.26	0	0	7.40	8116
8	Gas Meter	Boiler #1	0	0	0	0	0	0	0
9	M-13	Heat Pump #15	0	264	101	0	0		365
11	M-9	Heat Pump #1	0	35	0	0	0		35
26	ET1-21	Roof Top #6	0	0	0	0	0		0
27	Gas Meter	Roof Top #6	0	0.13	0	0	0	0.13	440
29	M-11	Heating Pump #13	0	509	168	201	190		1068
40	ET1-17	Pump #2	0	135	371	0	0		506
							cont'd		

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
41	M-12	Heat Pump #14	0	0	0	0	0		0
53	ET1-26	Electric Heat	0	0	0	0	0		0
BASEMENT AREA									
15	Gas Meter	Make-Up Air #1	0	0	0	0	0		0
44	M-5	Heat Pump #5	0	0	0	0	0		0
50	M-6	Heat Pump #6	0	0	0	0	0		0
51	M-7	Heat Pump #7	0	0	0	0	0		0
SHOOTING RANGE									
28	Gas Meter	Make-Up Air #2	0	0	0	0	0		0
								Gas Elec.	0 0
							Total:		0

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
1	ET1-22	Hot Water Pump #7	0	0	0	0	0		0
2	ET1-23	Hot Water Pump #8	0	0	0	0	0		0
5	Gas Meter	Water Heater #1	0	0	0	0	0		0
7	Gas Meter	Boiler #2	0	0	0	0	0		0
8	Gas Meter	Boiler #1	0	0	0	0	0		0
9	M-13	Heat Pump #15	0	0	0	0	0		0
11	M-9	Heat Pump #1	0	0	0	0	0		0
26	ET1-21	Roof Top #6	0	0	0	0	0		0
27	Gas Meter	Roof Top #6	0	0	0	0	0		0
29	M-11	Heating Pump #13	0	0	0	0	0		0
40	ET1-17	Pump #2	0	0	0	0	0		0
							cont'd		

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
41	M-12	Heat Pump #14	150	24	16	0			190
53	ET1-26	Electric Heat	400	200	0	0			600
BASEMENT	AREA								
15	Gas Meter	Make-Up Air #1	0.27	0	0	0		0.27	293
44	M-5	Heat Pump #5	463	441	708	0			1612
50	M-6	Heat Pump #6	476	455	595	0			1526
51	M-7	Heat Pump #7	322	228	425	0			975
SHOOTING	RANGE								
28	Gas Meter	Make-Up Air #2	0.13	0.29	0.61	0		1.04	1143
								Gas Elec.	57897 13789
							Total:		71684

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
1	ET1-22	Hot Water Pump #7	381	403	773	0			1557
2	ET1-23	Hot Water Pump #8	22	56	0	0			78
5	Gas Meter	Water Heater #1	1.50	1.44	2.60	0		5.54	5479
7	Gas Meter	Boiler #2	23.44	0.45	12.88	0		36.77	40317
8	Gas Meter	Boiler #1	6.90	0.21	1.92	0		9.03	9903
9	M-13	Heat Pump #15	417	252	668	0			1337
11	M-9	Heat Pump #1	1156	725	3248	0			5129
26	ET1-21	Roof Top #6	22	0	0	0			22
27	Gas Meter	Roof Top #6	0.53	0	0.16	0		0.69	762
29	M-11	Heat Pump #13	268	86	407	0			761
40	ET1-17	Pump #2	0	0	0	0			0
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
41	M-12	Heat Pump #14	209	99	300	317			925
53	ET	Electric Heat	600	300	500	600			2000
BASEMENT AREA									
15	Gas Meter	Make-Up Air #1	0.11	0.80	0.24	0.59		1.74	1113
44	M-5	Heat Pump #5	556	363	547	402			1868
50	M-6	Heat Pump #6	409	400	570	404			1783
51	M-7	Heat Pump #7	371	292	430	316			1409
SHOOTING RANGE									
28	Gas Meter	Make-Up Air #2	0.32	0.48	0.35	0.45		1.60	1758
								Gas Elec.	76033 20202
							Total:		96235

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
1	ET1-22	Hot Water Pump #7	0	0	0	224			224
2	ET1-23	Hot Water Pump #8	493	290	448	134			1365
5	Gas Meter	Water Heater #1	1.68	1.58	1.84	1.42		6.52	7149
7	Gas Meter	Boiler #2	8.42	7.48	7.48	6.73		30.11	34779
8	Gas Meter	Boiler #1	6.09	6.60	7.08	6.25		26.02	28538
9	M-13	Heat Pump #15	643	319	763	442			2167
11	M-9	Heat Pump #1	2660	1449	2049	1530			7688
26	ET1-21	Roof Top #6	28	0	11	11			50
27	Gas Meter	Roof Top #6	0.48	0.21	0.96	0.80		2.45	2696
29	M-11	Heat Pump #13	128	135	201	259			723
40	ET1-17	Pump #2	0	0	0	0			0
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu.m. x 100	kwh
41	M-12	Heat Pump #14	57	164	569	539	382		1711
53	ET1-26	Electric Heat	0	400	0	100	100		600
BASEMENT AREA									
15	Gas Meter	Make Up Air #1	0.16	0.61	0.43	0.11	0.13	1.44	1582
44	M-5	Heat Pump #5	372	444	462	463	471		2212
50	M-6	Heat Pump #6	341	397	364	387	380		1869
51	M-7	Heat Pump #7	423	360	245	376	367		1771
SHOOTING RANGE									
28	Gas Meter	Make-Up Air #2	1.50	0.19	0.35	0.43	0.13	2.60	2842
								Gas Elec.	112629 26113
							Total:		138742

NAME OF COMPLEX: TISDALE

AREA: MAIN FLOOR & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu.m. x 100	kwh
1	ET1-22	Hot Water Pump #7	358	403	381	381	336		1859
2	ET1-23	Hot Water Pump #8	22	0	0	0	112		134
5	Gas Meter	Water Heater #1	1.60	1.95	1.76	1.87	1.87	9.05	9933
7	Gas Meter	Boiler #2	9.35	12.80	11.28	15.63	10.18	59.24	64958
8	Gas Meter	Boiler #1	0	1.52	0	0	0	1.52	1670
9	M-13	Heat Pump #15	605	705	689	600	550		3149
11	M-9	Heat Pump #1	2522	4397	1824	1383	2009		12135
26	ET1-21	Roof Top #6	73	106	157	67	28		431
27	Gas Meter	Roof Top #6	6.12	6.55	9.19	5.64	1.36	28.86	31644
29	M-11	Heat Pump #13	6	176	38	10	12		242
40	ET1-17	Pump #2	0	0	0	0	0		0
							cont'd		

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 22 Jan 30					cu.m. x 100	kwh
22	ET1-2	Roof Top #2	112						112
23	Gas Meter	Roof Top #2	6.79					6.79	7442
24	ET1-1	Roof Top #1 - electric	56						56
25	Gas Meter	Roof Top #1 - gas	6.87					6.87	7530
36	M-15	Hot Water Pump	0						0
39	ET1-4	Brine Pump #2	700						700
42	M-2	Compressor #1	0						0
43	M-3	Compressor #2	4130						4130
								Gas Elec.	14972 4998
							Total:		19970

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Dec 12 Dec 18	Dec 19 Jan 1	Jan 7 Jan 8	Jan 9 Jan 15	Jan 16 Jan 21	cu.m. x 100	kwh
22	ET1-2	Roof Top #2	224	336	112	112	1568		2352
23	Gas Meter	Roof Top #2	11.71	20.26	4.62	8.90	9.35	54.84	60124
24	ET1-1	Roof Top #1 - electric	112	224	56	168	168		628
25	Gas Meter	Roof Top #1 - gas	10.26	17.10	4.57	8.47	10.93	51.33	56285
36	M-15	Hot Water Pump	4	64	27	35	134		265
39	ET1-4	Brine Pump #2	420	1780	700	840	560		4200
42	M-2	Compressor #1	0	0	30	0	0		30
43	M-3	Compressor #2	2207	924	936	922	948		5937
								Gas Elec.	116409 13512
							Total:		129921

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
22	ET1-2	Roof Top #2	11	34	11	22	426		504
23	Gas Meter	Roof Top #2	0.56	0.64	0.85	1.58	22.37	26.00	28509
24	ET1-1	Roof Top #1 - electric	11	11	0	112	336		470
25	Gas Meter	Roof Top #1 - gas	0.45	0.83	1.50	1.90	20.85	25.53	27982
36	M-15	Hot Water Pump	47	38	38	20	178		321
39	ET1-4	Brine Pump #2	504	728	756	532	2380		4900
42	M-2	Compressor #1	119	59	30	63	86		357
43	M-3	Compressor #2	2506	3740	3646	3709	14254		27855
								Gas Elec.	56491 34407
							Total		90898

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 12 Sept 18	Sept 19 Sept 25	Sept 26 Oct 3	Oct 4 Oct 12	Oct 13 Oct 16	cu.m. x 100	kwh
22	ET1-2	Roof Top #2	0	0	0	0	0		0
23	Gas Meter	Roof Top #2	0	0	0	0	0		0
24	ET1-1	Roof Top #1 - electric	0	0	0	0	0		0
25	Gas Meter	Roof Top #1 - gas	0	0	0	0	0		0
36	M-15	Hot Water Pump	0	0	0	0	0		0
39	ET1-4	Brine Pump #2	0	0	0	56	364		420
42	M-2	Compressor #1	0	0	4	192	103		299
43	M-3	Compressor #2	0	0	200	3500	1285		4985
								Gas Elec.	0 5704
							Total:		5704

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 28	Jun 29 Aug 26	Aug 29 Sept 11	cu.m. x 100	kwh
22	ET1-2	Roof Top #2	0	0	0	0	0		0
23	Gas Meter	Roof Top #2	0	0.05	0	0	0	0.05	59
24	ET1-1	Roof Top #1 - electric	0	22					22
25	Gas Meter	Roof Top #1 - gas	0	0.13	0	0	0	0.13	147
36	M-15	Hot Water Pump	0	0	0	0	0		0
39	ET1-4	Brine Pump #2	0	0	0	0	0		0
42	M-2	Compressor #1	0	0	0	0	0		0
43	M-3	Compressor #2	0	0	0	0	0		0
								Gas Elec.	206 22
							Total:		228

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
22	ET1-2	Roof Top #2	0	0	0	0	0		0
23	Gas Meter	Roof Top #2	0	0	0	0	0		0
24	ET1-1	Roof Top #1 - electric	0	0	0	0	0		0
25	Gas Meter	Roof Top #1 - gas	0	0	0	0	0		0
36	M-15	Hot Water Pump	0	0	0	0	0		0
39	ET1-4	Brine Pump #2	0	0	0	0	0		0
42	M-2	Compressor #1	0	0	0	0	0		0
43	M-3	Compressor #2	0	0	0	0	0		0
								Gas Elec.	0 0
							Total		0

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
22	ET1-2	Roof Top #2	157	0	0	0			157
23	Gas Meter	Roof Top #2	3.40	0.24	0.40	0		4.04	4864
24	ET1-1	Roof Top #1 - electric	325	0	0	0			325
25	Gas Meter	Roof Top #1 - gas	2.24	0.11	0.24	0		2.59	2842
36	M-15	Hot Water Pump	5	0	0	0			5
39	ET1-4	Brine Pump #2	280	0	0	0			280
42	M-2	Compressor #1	0	0	0	0			0
43	M-3	Compressor #2	0	0	0	0			0
								Gas Elec.	7706 767
							Total:		8473

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
22	ET1-2	Roof Top #2	112	112	112	123			459
23	Gas Meter	Roof Top #2	5.18	5.10	6.12	4.49		20.89	22913
24	ET1-1	Roof Top #1 - electric	258	347	448	235			1288
25	Gas Meter	Roof Top #1 - gas	3.55	3.39	4.57	3.20		14.71	16144
36	M-15	Hot Water Pump	50	46	51	40			187
39	ET1-4	Brine Pump #2	952	1064	1092	840			3948
42	M-2	Compressor #1	2107	1968	1350	314			5739
43	M-3	Compressor #2	1069	1175	342	357			2943
								Gas Elec.	39057 14564
							Total:		53621

NAME OF COMPLEX: TISDALE

AREA: CURLING RINK

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu.m. x 100	kwh
22	ET1-2	Roof Top #2	134	134	146	78	202		694
23	Gas Meter	Roof Top #2	0	0	0	0	4.01	4.10	4395
24	ET1-1	Roof Top #1 - electric	146	157	157	246	202		908
25	Gas Meter	Roof Top #1 - gas	0	0	0	0	3.13	3.13	3428
36	M-15	Hot Water Pump	29	34	35	34	34		166
39	ET1-4	Brine Pump #2	728	924	924	1008	868		4456
42	M-2	Compressor #1	3105	6869	317	2888	2550		15729
43	M-3	Compressor #2	47	0	426	167	4483		5123
								Gas	7823
								Elec.	26622
							Total:		34445

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 22 Jan 30					cu.m. x 100	kwh
52	ET1-11	Pump-1	0						0
42	M-2	Compressor #1	0						0
43	M-3	Compressor #2	2128						2128
								Gas Elec.	12658 6236
							Total:		18894

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 22 Jan 30					cu.m. x 100	kwh
12	ET1-8	Circulator Pump #5	280						280
13	ET1-9	Circulator Pump #6	0						0
14	ET1-10	Cooler #1	940						940
16	ET1-7	Roof Top #5	187						187
17	Gas Meter	Roof Top #5	2.19					2.19	2403
18	ET1-6	Roof Top #4	187						187
19	Gas Meter	Roof Top #4	4.62					4.62	5069
20	ET1-5	Roof Top #3	279						279
21	Gas Meter	Roof Top #3	4.73					4.73	5186
37	ET1-18	Pump #3	0						0
38	ET1-16	Brine Pump #1	2235						2235
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Dec 12 Dec 18	Dec 19 Jan 1	Jan 2 Jan 8	Jan 9 Jan 15	Jan 16 Jan 21	cu.m. x 100	kwh
52	ET1-11	Pump-1	0	188	94	0	94		375
42	M-2	Compressor #1	0	0	60	0	0		60
43	M-3	Compressor #2	4481	1876	1899	1872	1926		12054
								Gas Elec.	107501 37033
							Total:		144534

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Dec 12 Dec 18	Dec 19 Jan 1	Jan 2 Jan 8	Jan 9 Jan 15	Jan 16 Jan 21	cu.m. x 100	kwh
12	ET1-8	Circulator Pump #5	0	1960	840	1120	1680		5600
13	ET1-9	Circulator Pump #6	0	0	0	0	0		0
14	ET1-10	Cooler #1	930	1395	470	930	930		4685
16	ET1-7	Roof Top #5	187	0	187	0	187		561
17	Gas Meter	Roof Top #5	3.07	3.98	2.70	4.89	4.44	19.08	20920
18	ET1-6	Roof Top #4	374	187	0	0	0		561
19	Gas Meter	Roof Top #4	7.64	11.39	3.71	7.40	10.13	40.27	44155
20	ET1-5	Roof Top #3	374	374	0	374	94		1216
21	Gas Meter	Roof Top #3	19.83	5.21	2.33	5.56	5.77	38.70	42426
37	ET1-18	Pump #3	0	0	0	0	0		0
38	ET1-16	Brine Pump #1	0	4843	2235	2608	2235		11921
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
52	ET1-11	Pump-1	338	225	188	206	544		1501
42	M-2	Compressor #1	237	121	60	127	174		719
43	M-3	Compressor #2	5089	7595	7403	7529	28940		56556
								Gas Elec.	53032 89216
							Total:		142248

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
12	ET1-8	Circulator Pump #5	980	896	560	1120	3920		7476
13	ET1-9	Circulator Pump #6	0	0	0	0	448		448
14	ET1-10	Cooler #1	2350	0	0	940	3760		7050
16	ET1-7	Roof Top #5	19	56	19	75	206		375
17	Gas Meter	Roof Top #5	0.11	0.37	0.32	1.18	8.69	10.67	11690
18	ET1-6	Roof Top #4	19	56	112	75	299		561
19	Gas Meter	Roof Top #4	0.56	0.67	0.64	1.60	17.56	21.03	23059
20	ET1-5	Roof Top #3	0	0	0	131	243		374
21	Gas Meter	Roof Top #3	1.23	1.07	0.80	1.74	11.84	16.68	18283
37	ET1-18	Pump #3	0	0	0	0	0		0
38	ET1-16	Brine Pump #1	1490	2161	75	1788	8642		14156
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 12 Sept 18	Sept 19 Sept 25	Sept 26 Oct 3	Oct 4 Oct 12	Oct 13 Oct 16	cu.m. x 100	kwh
52	FT1-11	Pump-1	0	0	0	0	113		113
42	M-2	Compressor #1	0	0	7	391	210		608
43	M-3	Compressor #2	0	0	408	7108	2570		10086
								Gas Elec.	3429 22635
							Total:		26064

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 12 Sept 18	Sept 19 Sept 25	Sept 26 Oct 3	Oct 4 Oct 12	Oct 13 Oct 16	cu.m.	kwh
12	ET1-8	Circulator Pump #5	0	280	1120	1372	448		3220
13	ET1-9	Circulator Pump #6	0	0	0	112	0		112
14	ET1-10	Cooler #1	0	0	940	940	470		2350
16	ET1-7	Roof Top #5	0	0	0	0	0		0
17	Gas Meter	Roof Top #5	0	0	0	0.37	0.45	0.82	908
18	ET1-6	Roof Top #4	0	0	0	0	0		0
19	Gas Meter	Roof Top #4	0	0	0.05	0.35	0.53	0.93	1026
20	ET1-5	Roof Top #3	0	0	0	167	19		186
21	Gas Meter	Roof Top #3	0	0	0	0.48	0.88	1.36	1495
37	ET1-18	Pump #3	0	0	0	0	0		0
38	ET1-16	Brine Pump #1	0	447	1788	3725	0		5960
							cont'd		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 28	Jun 29 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
52	ET1-11	Pump-1	0	450	0	0	188		638
42	M-2	Compressor #1	0	0	0	0	0		0
43	M-3	Compressor #2	0	0	0	0	0		0
								Gas Elec.	1144 13033
							Total:		14177

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 28	Jun 29 Aug 28	Aug 29 Sept 11	cu.m. x 100	kwh
12	ET1-8	Circulator Pump #5	0	2576	1204	1820	2240		7840
13	ET1-9	Circulator Pump #6	0	0	840	3640	0		4480
14	ET1-10	Cooler #1	0	0	0	0	0		0
16	ET1-7	Roof Top #5	0	0	0	0	0		0
17	Gas Meter	Roof Top #5	0	0.19	0	0	0	0.19	205
18	ET1-6	Roof Top #4	0	0	75	0	0		75
19	Gas Meter	Roof Top #4	0	0.56	0.027	0	0	0.58	645
20	ET1-5	Roof Top #3	0	0	0	0	0		0
21	Gas Meter	Roof Top #3	0	0.13	0	0.13	0	0.26	294
37	ET1-18	Pump #3	0	0	0	0	0		0
38	ET1-16	Brine Pump #1	0	0	0	0	0		0

cont'd.

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu.m. x 100	kwh
52	ET1-11	Pump-1	0	0	0	0	0		0
42	M-2	Compressor #1	0	0	0	0	0		0
43	M-3	Compressor #2	0	0	0	0	0		0
								Gas	0
								Elec.	0
							Total:		0

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Apr 25 May 1	May 2 May 8	May 9 May 15	May 16 May 23	May 24 May 29	cu. m. x 100	kwh
12	ET1-8	Circulator Pump #5	0	0	0	0	0		0
13	ET1-9	Circulator Pump #6	0	0	0	0	0		0
14	ET1-10	Cooler #1	0	0	0	0	0		0
16	ET1-7	Roof Top #5	0	0	0	0	0		0
17	Gas Meter	Roof Top #5	0	0	0	0	0		0
18	ET1-6	Roof Top #4	0	0	0	0	0		0
19	Gas Meter	Roof Top #4	0	0	0	0	0		0
20	ET1-5	Roof Top #3	0	0	0	0	0		0
21	Gas Meter	Roof Top #3	0	0	0	0	0		0
37	ET1-18	Pump #3	0	0	0	0	0		0
38 .	ET1-11	Brine Pump #1	0	0	0	0	0		0
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu.m. x 100	kwh
52	ET1-11	Pump-1	20	0	95	0			115
42	M-2	Compressor #1	0	0	0	0			0
43	M-3	Compressor #2	0	0	0	0			0
								Gas Elec.	3194 4940
							Total:		8134

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Mar 28 Apr 3	Apr 4 Apr 10	Apr 11 Apr 17	Apr 18 Apr 24		cu. m. x 100	kwh
12	ET1-8	Circulator Pump #5	896	1064	1876	0			3836
13	ET1-9	Circulator Pump #6	0	0	0	0			0
14	ET1-10	Cooler #1	94	0	0	0			94
16	ET1-7	Roof Top #5	0	19	0	0			19
17	Gas Meter	Roof Top #5	0.16	0	0.64	0		0.80	879
18	ET1-6	Roof Top #4	19	93	19	0			131
19	Gas Meter	Roof Top #4	0.94	0	0.99	0		1.93	2110
20	ET1-5	Roof Top #3	0	0	0	0			0
21	Gas Meter	Roof Top #3	0.16	0	0.03	0		0.19	205
37	ET1-18	Pump #3	0	0	0	0			0
38	ET1-16	Brine Pump #1	745	0	0	0			745
							cont'd.		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 May 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu.m. x 100	kwh
52	ET1-11	Pump-1	75	112	75	190			452
42	M-2	Compressor #1	4215	3936	2700	629			11480
43	M-3	Compressor #2	2139	2350	685	714			5888
								Gas Elec.	37707 35123
							Total:		72830

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Feb 28 Mar 6	Mar 7 Mar 13	Mar 14 Mar 21	Mar 22 Mar 27		cu. m. x 100	kwh
12	ET1-8	Circulator Pump #5	0	0	0	504			504
13	ET1-9	Circulator Pump #6	896	1092	1092	280			3360
14	ET1-10	Cooler #1	561	561	1215	374			2711
16	ET1-7	Roof Top #5	37	187	0	0			224
17	Gas Meter	Roof Top #5	3.53	2.11	1.66	0.27		7.57	8202
18	ET1-6	Roof Top #4	187	187	187	0			561
19	Gas Meter	Roof Top #4	3.98	2.67	4.62	1.31		12.58	13800
20	ET1-5	Roof Top #3	149	93	0	0			242
21	Gas Meter	Roof Top #3	7.91	5.05	1.12	0.24		14.32	15705
37	ET1-18	Pump #3	0	0	0	0			0
38	ET1-16	Brine Pump #1	2235	2608	2980	1788			9611
							cont'd		

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu. m. x 100	kwh
52	ET1-11	Pump -1	0	38	0	0	75		113
42	M-2	Compressor #1	6209	13738	634	5777	5100		31458
43	M-3	Compressor #2	94	0	852	334	8966		10246
								Gas Elec.	102462 64894
							Total:		167356

NAME OF COMPLEX: TISDALE

AREA: ARENA

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Jan 25 Jan 30	Jan 31 Feb 6	Feb 7 Feb 13	Feb 14 Feb 20	Feb 21 Feb 27	cu. m. x 100	kwh
12	ET1-8	Circulator Pump #5	896	957	952	1120	280		4205
13	ET1-9	Circulator Pump #6	0	0	0	0	280		280
14	ET1-10	Cooler #1	561	374	935	561	935		3366
16	ET1-7	Roof Top #5	205	224	168	131	75		803
17	Gas Meter	Roof Top #5	6.07	7.99	6.98	4.92	2.38	28.34	31058
18	ET1-6	Roof Top #4	187	187	336	224	187		1121
19	Gas Meter	Roof Top #4	3.82	6.36	6.17	5.64	3.10	25.09	27513
20	ET1-5	Roof Top #3	93	187	187	187	131		785
21	Gas Meter	Roof Top #3	5.67	9.94	9.54	7.48	7.40	40.03	43891
37	ET1-18	Pump #3	0	0	0	0	0		0
38	ET1-16	Brine Pump #1	2086	2235	2980	2608	2608		12517
							cont'd.		

TISDALE COMPLEX

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
23	ET1	Furnace North	0	0	1.32	2.63	14.48	18.43	20202
24	ET1	Furnace South	1.64	0	1.10	0	4.93	7.67	8409
25	ET1	Boiler #1	18.51	37.02	27.77	27.77	148.08	259.15	284064
26	ET1	Boiler #2	0	0	0	0	10.12	10.12	11120
27	ET1	Boiler #3	0	0	0	0	0	0	0
29	ET1	Kitchen Exhaust	0	0	0	0	42		42
29	Inter-locked with Kitchen Exhaust	Make-Up Air	0	0	0	0	3.85	3.85	4219
								Gas Elec.	328014 22943
								Total:	350957

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Oct 17 Oct 23	Oct 24 Oct 30	Oct 31 Nov 6	Nov 7 Nov 13	Nov 14 Dec 11	cu.m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	600	750	750	1200	4800		8100
2	ET1	Hall Rear Entrance Electric Heat	0	225	0	0	675		900
3	ET1	Washroom Electric Heat	0	0	0	0	0		0
4	ET1	Club Room Electric Heat	0	150	0	150	1200		1500
6	ET1	Kitchen Rear Entrance Electric Heat	0	0	0	0	0		0
7	ET1	Kitchen Staff Washroom Electric Heat	75	75	0	75	825		1050
8	ET1	Gen. Room Electric Heat	975	813	813	1300	1625		5526
9	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
10	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
21	ET1	Sprinkler Room Electric Heat	150	0	300	0	300		750
22	ET1	Secretary's Office Electric Heat	700	350	525	525	2975		5075
								cont'd.	

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 17 Sept 18	Sept 19 Sept 25	Sept 26 Oct 2	Oct 3 Oct 10	Oct 11 Oct 16	cu.m. x 100	kwh
23	ET1	Furnace North	0.66	0	0.66	0.66	0	1.98	2165
24	ET1	Fornace South	0	0	0	0	1.64	1.64	1802
25	ET1	Boiler #1	180.48	18.51	27.77	27.77	18.51	273.04	299281
26	ET1	Boiler #2	0	0	0.85	0.85	0	1.70	1853
27	ET1	Boiler #3	0	0	0	0	0	0	0
29	ET1	Kitchen Exhaust	0	0	0	0	0	0	0
29	Inter-locked with Kitchen Exhaust	Make-Up Air	0	0	0	0	0	0	0
								Gas Elec.	305101 9626
								Total:	314727

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			Sept 12 Sept 18	Sept 19 Sept 25	Sept 26 Oct 2	Oct 3 Oct 10	Oct 11 Oct 16	cu.m. x 100	kwh
1	ET1	Hall Main Entrance Electric Heat	0	300	300	900	900		2400
2	ET1	Hall Rear Entrance Electric Heat	0	0	0	225	0		225
3	ET1	Washroom Electric Heat	0	0	0	0	0		0
4	ET1	Club Room Electric Heat	0	0	300	750	0		1050
6	ET1	Kitchen Rear Entrance Electric Heat	0	0	0	0	0		0
7	ET1	Kitchen Staff Washroom Electric Heat	0	150	150	375	75		750
8	ET1	Gen. Room Electric Heat	0	325	488	1138	0		1951
9	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
10	ET1	Mezzanine Electric Heat	0	0	0	0	0		0
21	ET1	Sprinkler Room Electric Heat	0	0	0	300	150		450
22	ET1	Secretary's Office Electric Heat	525	175	875	875	350		2800
								cont'd	

NAME OF COMPLEX: HUMBOLDT

AREA: MAIN & MEZZANINE

ITEM No.	METER No.	EQUIPMENT DESCRIPTION	PERIOD					TOTAL	
			May 30 Jun 5	Jun 6 Jun 14	Jun 15 Jun 26	Jun 27 Aug 28	Aug 29 Sept 11	cu.m x 100	kwh
23	ET1	Furnace North	0	0	0	0	0.66	0.66	722
23	ET1	Furnace South	0	0	0	0.55		0.55	600
25	ET1	Boiler #1	13.88	18.51	23.14	0	4.63	60.16	65944
26	ET1	Boiler #2	6.76	3.38	0	1.69	0	11.83	12973
27	ET1	Boiler #3	0	0	0	0	0	0	0
29	ET1	Kitchen Exhaust	28	42	0	0	0		70
29	Inter-locked with Kitchen Exhaust	Make-Up Air	2.57	3.85	0	0	0	6.42	7032
								Gas Elec.	87271 2021
								Total:	89292

APPENDIX "D"

Utilization Schedules

UTILIZATION SCHEDULES

The following average hours/week have been determined from program schedules and information provided by the management of the Tisdale and Humboldt facilities:

Tisdale

Arena - 95 hours/week

Curling - 80 hours/week

Community Centre - 33 hours/week

Humboldt

Arena - 80 hours/week

Curling - 84 hours/week

Community Centre - 35 hours/week

APPENDIX "E"

Thermographic Studies
Tisdale Complex
Humboldt Uniplex

ENERGY TECHNOLOGY BRANCH

SASKATCHEWAN ENERGY & MINES

Thermal Focus Incorporated

THERMOGRAPHIC SURVEY
OF THE
TISDALE RECREATION CENTER

MARCH 1983

ENERGY MANAGEMENT — THERMOGRAPHIC SPECIALISTS

Thermal Focus Incorporated

BOX 426, SUB 6, SASKATOON, SASK. S7N 0W0
Phone (306) 374-6300

Thermal Focus Incorporated is pleased to present this report of the inspection of the Tisdale Recreation Complex.

A full peripheral external infrared scan, together with a selective internal infrared inspection was performed on February 28 and March 17, 1983. Each anomaly has been recorded in hard-copy as thermograms and photographs. The full external facade of the building was scanned and recorded on video tape for later review or discussion.

Singular details are addressed by statement on each thermogram sheet. More general details and elements common to the various individual thermal expressions are dealt with under the headings of General and Specific Comments respectively. Under the actual conditions of the inspection the dominant anomalies displayed were:

a) Thermal bridging through the structural members of external walls which feature appears to be contributing significantly to heat loss.

b) Condensation on structural members has apparently degraded insulation and amplified the thermal effects of bridging.

c) Moisture movement through the envelope has caused degradation of the insulation and is a contributing factor to heat loss. Efflorescence on the external surface is a positive indicator of this problem.

Thermal Focus Incorporated

CONTENTS

Introduction

List of Contents

1.0 External Thermographic Survey

- (a) Master data sheet
- (b) Location of infrared survey stations
- (c) Thermograms

2.0 Thermography and Related Terminology

3.0 General Comments

4.0 Specific Comments

5.0 Conclusions

6.0 References

heatscan by THERMAL FOCUS Inc.

MANAGEMENT DATA:

CLIENT : Energy Technology Branch
: Saskatchewan Energy & Mines

ADDRESS : 1914 Hamilton Street
: Regina, Saskatchewan
: S4P 4V4

TELEPHONE NO. :

DATE : 1. 23rd February 83
2. 17th March 83.
TIME : 1. 23.30 - 03.00
2. 23.30 - 02.30
QUOTATION NO. :
REPORT NO. :

PURCHASE NO. :
INVOICE NO. :

CONSTRUCTION DATA:

BUILDING DESCRIPTION : Recreational complex with hockey and curling rink, with large foyer and various meeting rooms.

BUILDING AGE :

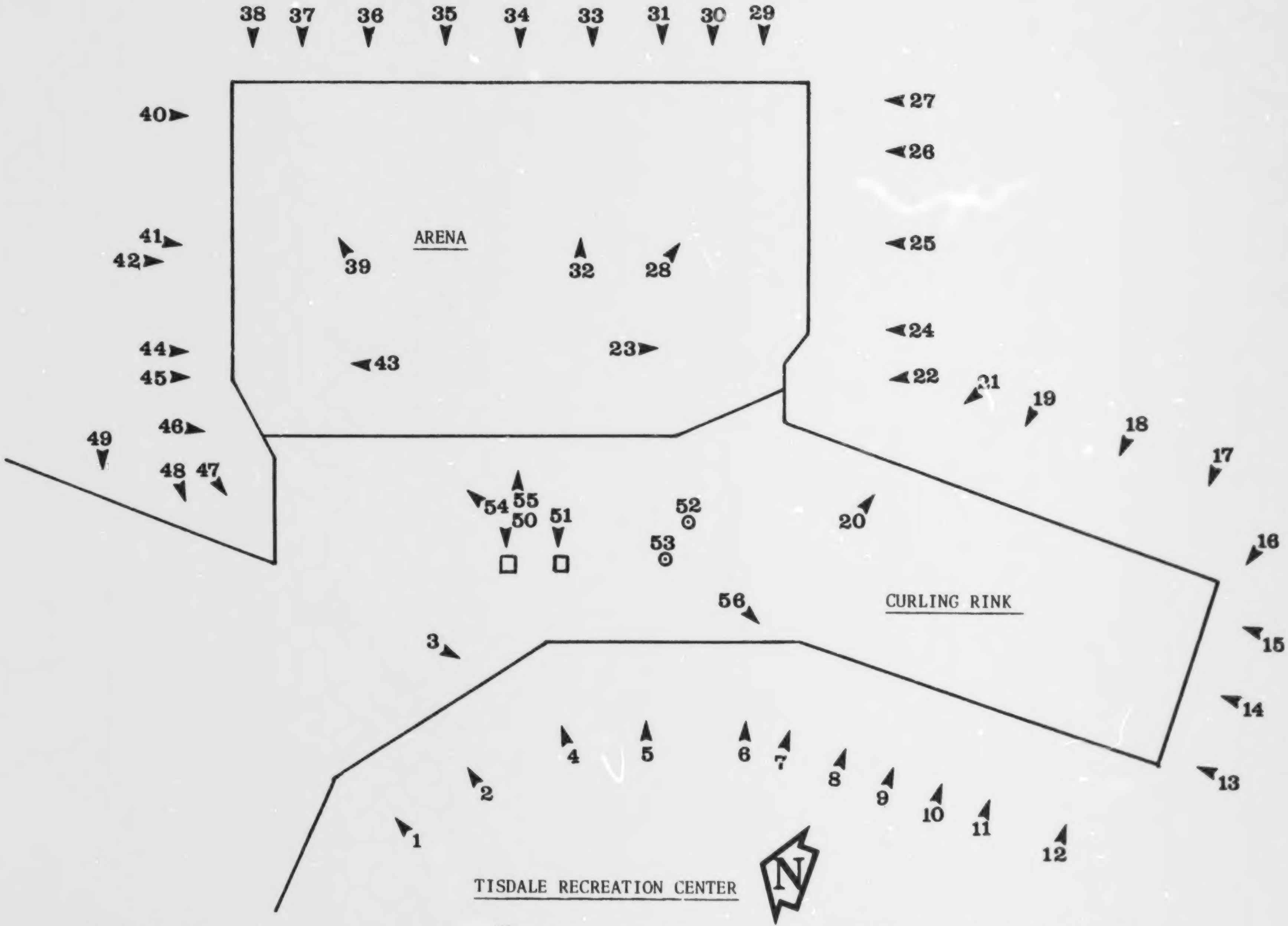
HEAT DISTRIBUTION SYSTEM : Ducted forced air.

RELATED HEAT LOSS HISTORY : History of excessive heat loss.

ENVIRONMENTAL DATA:

	23. 2. 83:	17. 3. 83.	
OUTSIDE AIR TEMPERATURE :	-7°	-13°	C.
WIND DIRECTION :	West	nil	
WIND SPEED :	10 km/hr	nil	
CLOUD COVER :	20%	nil	
PRECIPITATION :	nil	nil	

ADDITIONAL COMMENTS: Internal inspection performed the day of -7°.
External inspection performed on the day with -13°.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CURLING RINK
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N

TISDALE RECREATION CENTER

not to scale

Thermogram Locations

Infrared Survey by Thermal Focus

heatscan by THERMAL FOCUS Inc.

PHOTO.
NO.
2

LOCATION : Tisdale Civic Center

DESCRIPTION : Central section of main entrance.

PROBLEM IDENTIFICATION :

AIR INFILTRATION	: X
INADEQUATE INSULATION	:
THERMAL BRIDGING	: X
CONDENSATION	: X

DATA :

INTERIOR AIR TEMPERATURE	: C.
EXTERIOR AIR TEMPERATURE	: -7° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Same as previous. Note the cold steel column extending from the outside into the inside of the building.

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO: TFI 05

heatscan by THERMAL FOCUS Inc.

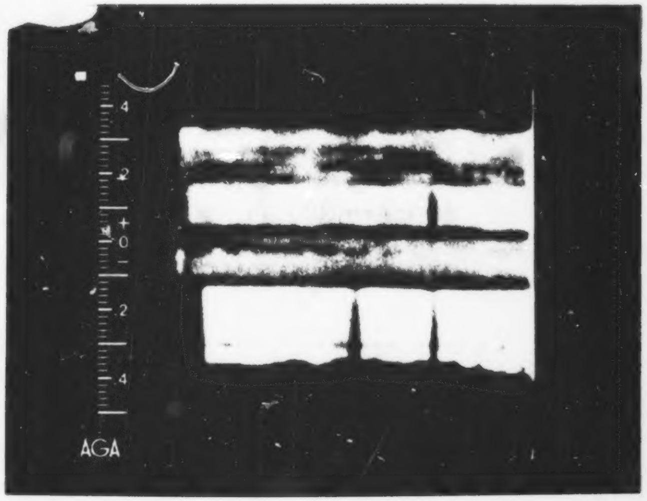


PHOTO.
NO.
1

LOCATION : Tisdale Civic Center

DESCRIPTION : North section of the main entrance

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Excessive heat loss from window area and door. Thermal bridging and condensation apparent on upper wall.

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO: TFI 01

heatscan by THERMAL FOCUS Inc.

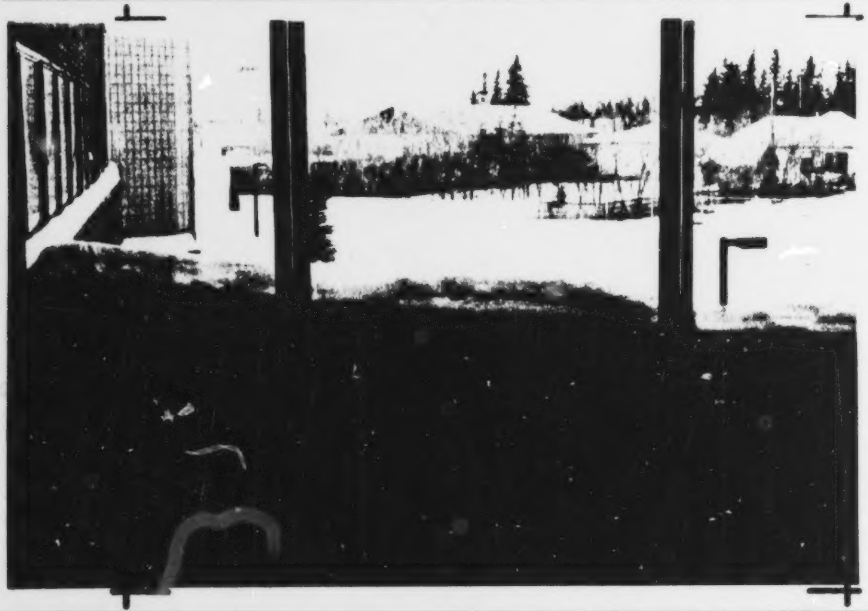
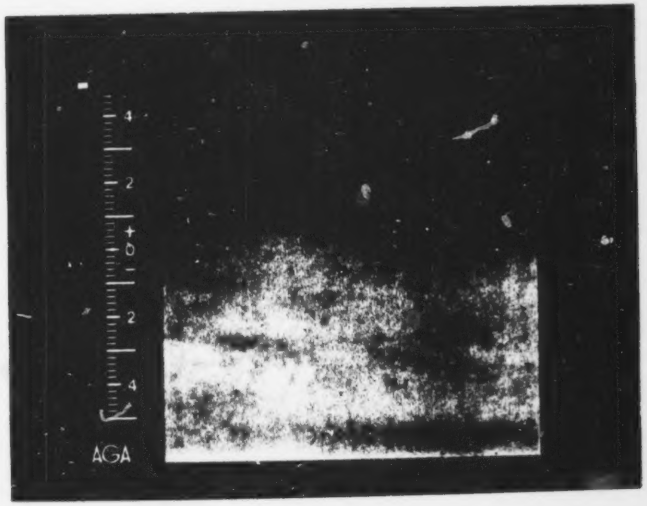


PHOTO.
NO.
3



LOCATION : Tisdlae Civic Center

DESCRIPTION : Upper floor meeting room.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : x
INADEQUATE INSULATION :
THERMAL BRIDGING : x
CONDENSATION : x

REFER TO COMMENTS BELOW :

REFER TO SUMMARY OF FINDINGS :

DATA :

ROOM AIR TEMPERATURE : 18.2° C.
AVERAGE WALL TEMPERATURE : C.
AVERAGE WALL TEMPERATURE INDEX :
ISOTHERM DIFFERENCE : ITU.
TEMPERATURE DIFFERENCE TO FAULT : C.
FAULT TEMPERATURE INDEX :

AIR INFILTRATION (WHEN RELEVANT) : M/S.
RELATIVE HUMIDITY (WHEN REQUIRED) : %

SPECIAL COMMENTS : Top of column temperature (in ceiling area) is 16.1° C. The temperature of the column in the inside room area is 17.1° C. This steel column is acting as a cooling fin, drawing heat away.

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO: TFI 03

See specific comments.

heatscan by THERMAL FOCUS Inc.

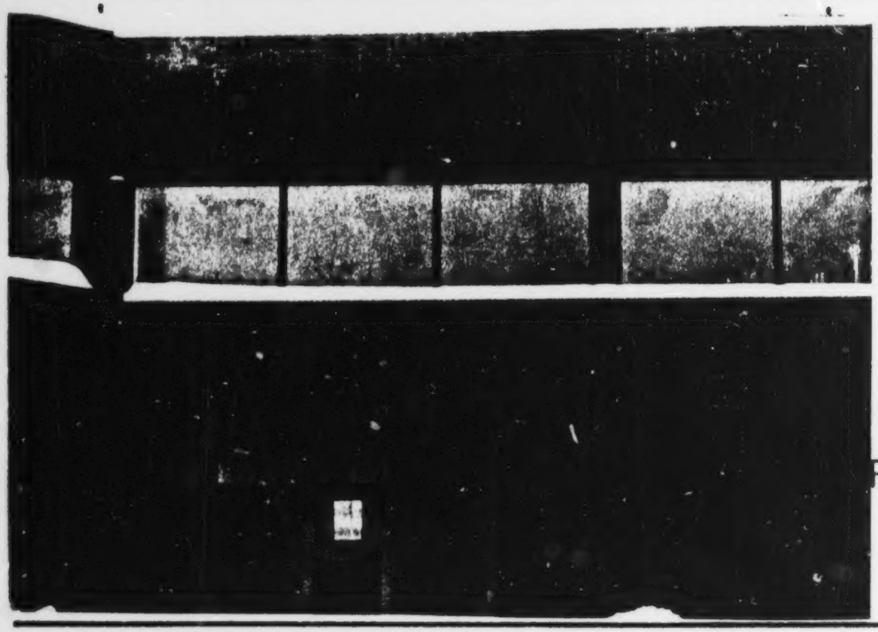
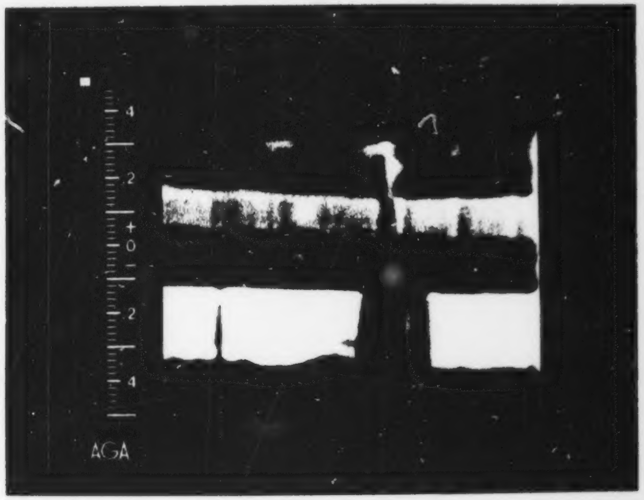


PHOTO.
NO.
4



LOCATION : Tisdale Civic Center

DESCRIPTION : South section of main entrance.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Same as previous.

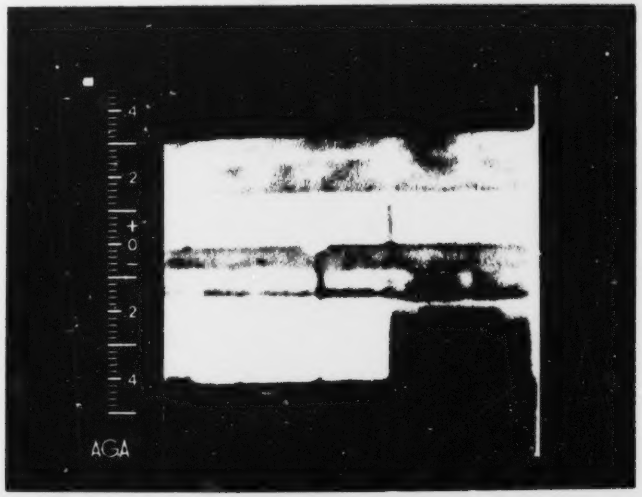
DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO: TFI 05

heatscan by THERMAL FOCUS Inc.

PHOTO. NO.

5



LOCATION : Tisdale Civic Center

DESCRIPTION : West wall of Foyer area.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS : X

SPECIAL COMMENTS :

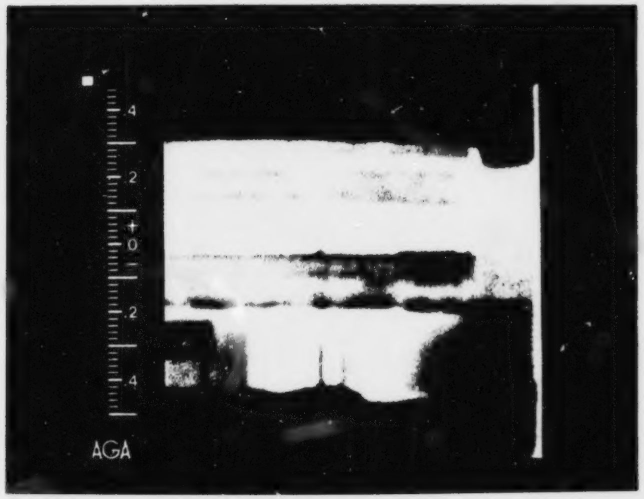
DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO; TFI 05

heatscan by THERMAL FOCUS Inc.

Photo not available -
but continuous with No. 5.

PHOTO.
NO.
6



LOCATION : Tisdale Civic Center

DESCRIPTION : West wall of Foyer area.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

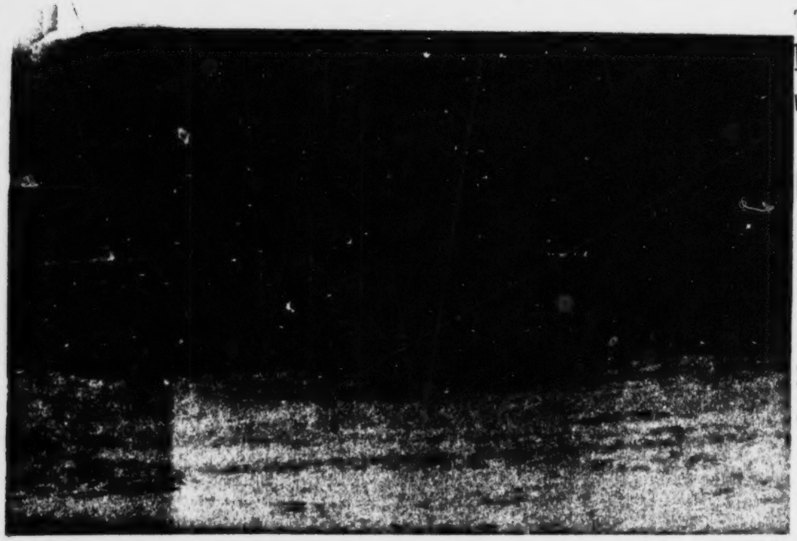
REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS : X

SPECIAL COMMENTS :

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO; TFI 0[illegible]

heatscan by THERMAL FOCUS Inc.



LOCATION :

Tisdale Communiplex

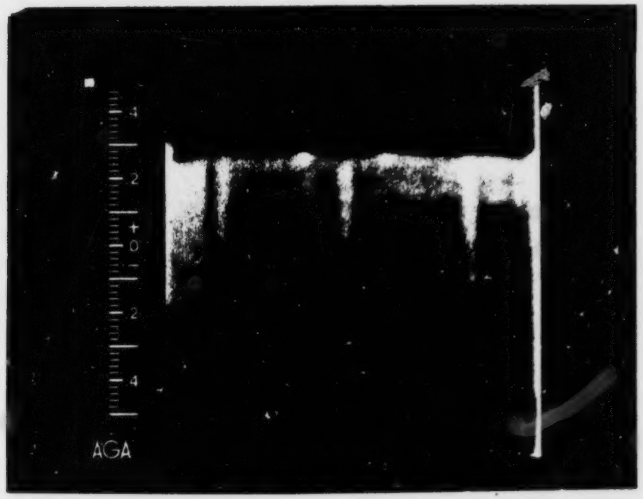
DESCRIPTION :

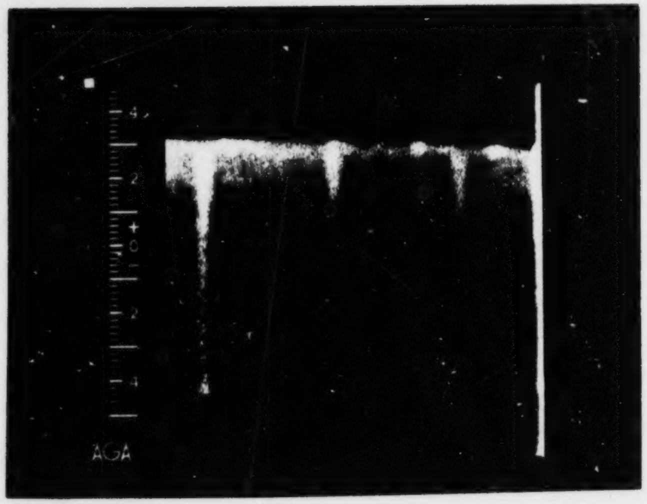
West wall of curling ri

PROBLEM
IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 7





LOCATION :

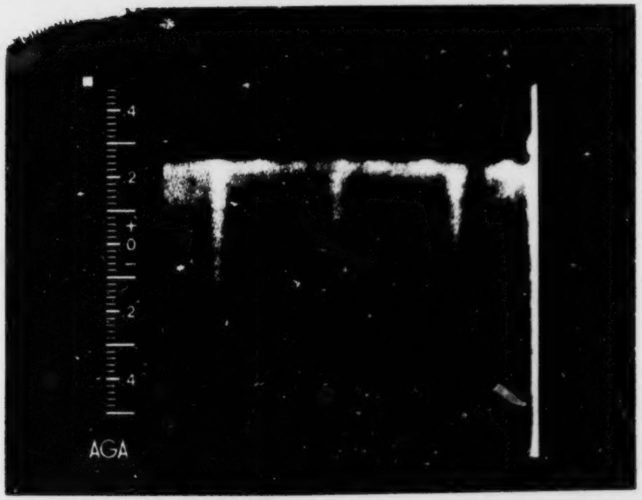
Tisdale Civic Center

DESCRIPTION :

PROBLEM
IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

8 PHOTO NO. 9



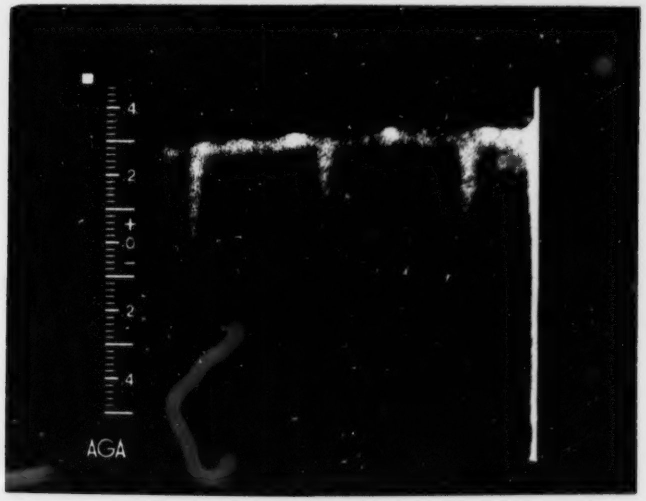
HEAT LOSS EVALUATION SHEET NO: TFI 04

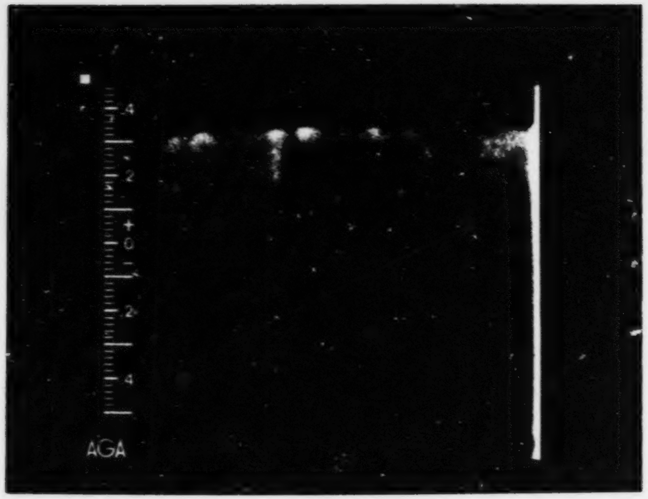
LOCATION :
Tisdale Civic Center
DESCRIPTION :
West wall of curling r

PROBLEM
IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 10



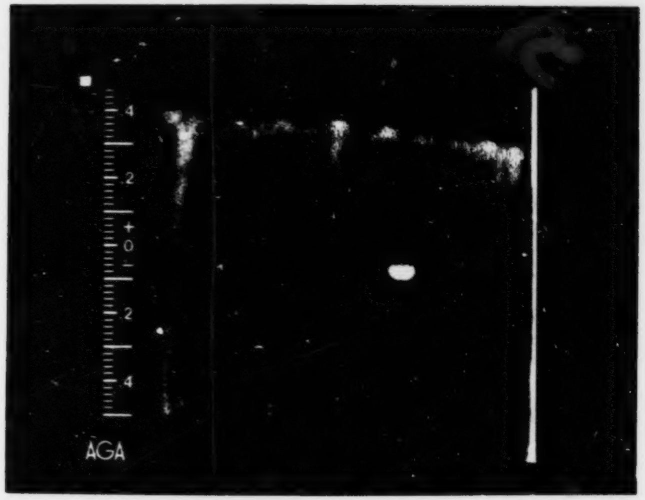


LOCATION :
Tisdale Civic Center
DESCRIPTION :
West wall of Curling Ri

PROBLEM
IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

11 PHOTO NO. 12



heatscan by THERMAL FOCUS Inc.

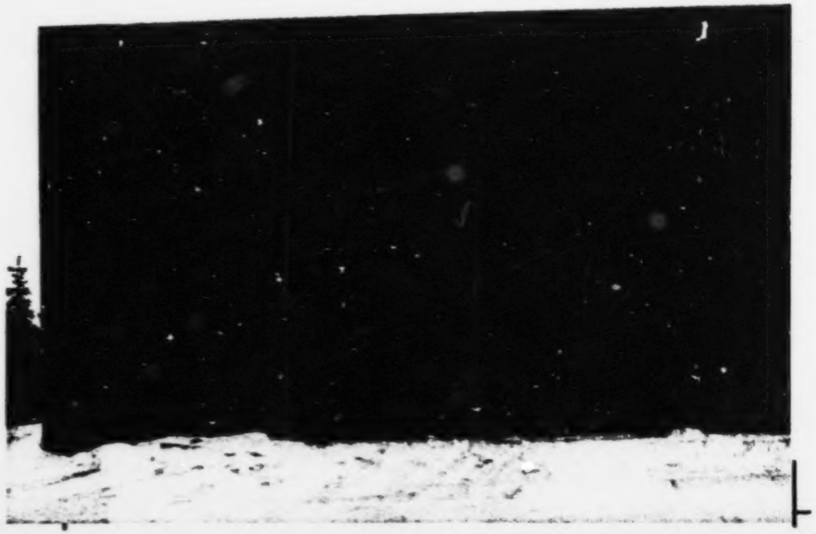
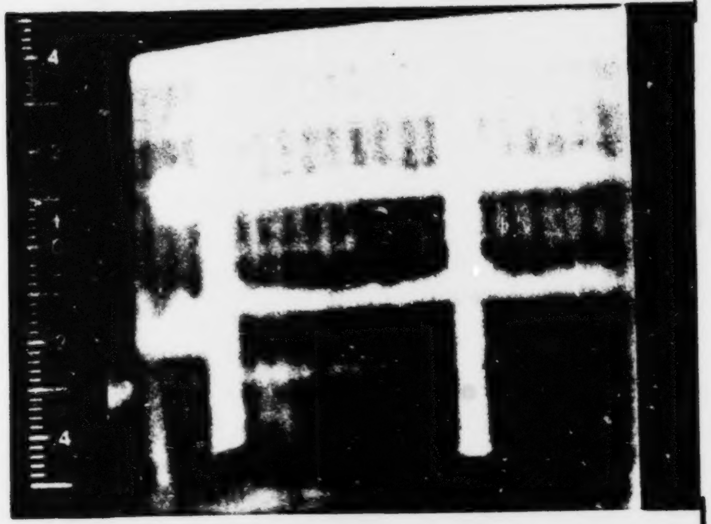


PHOTO.
NO.
13



LOCATION : Tisdale Communiplex

DESCRIPTION : South-west corner of curling rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

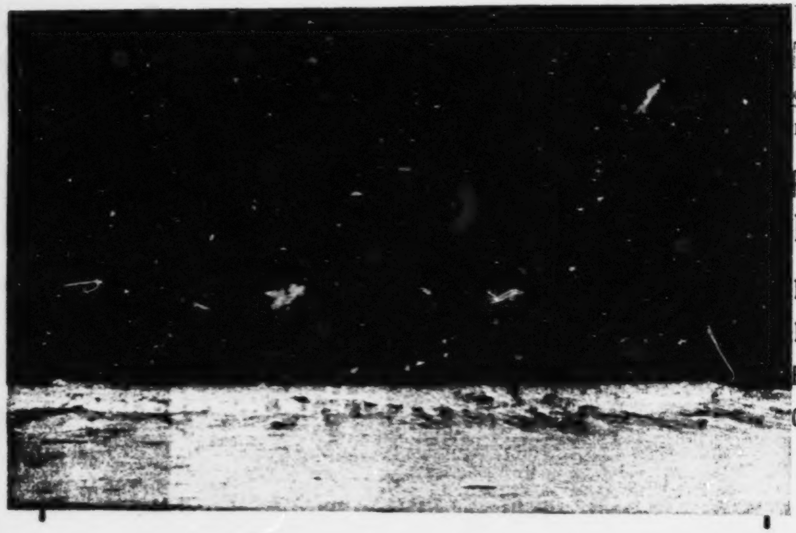
INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS :

DATE :
CONTRACT NO:



LOCATION :

Tisdale Communiplex

DESCRIPTION :

South wall of curling rink

PROBLEM IDENTIFICATION :

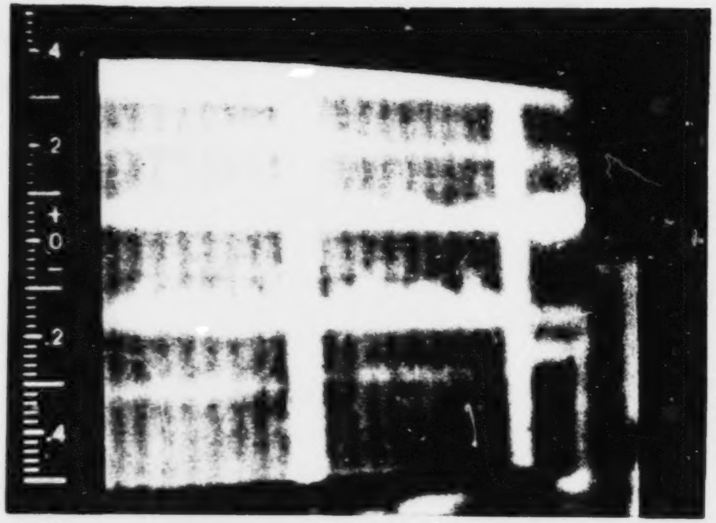
INFILTRATION : X

INSULATION : X

BRIDGING : X

CONDENSATION : X

PHOTO NO. 14



LOCATION :

as above

DESCRIPTION :

as above

PROBLEM IDENTIFICATION :

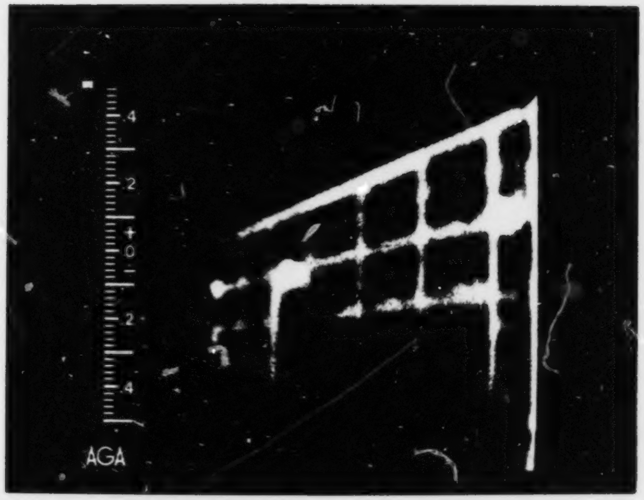
INFILTRATION X

INSULATION X

BRIDGING X

CONDENSATION X

15 PHOTO NO. 16



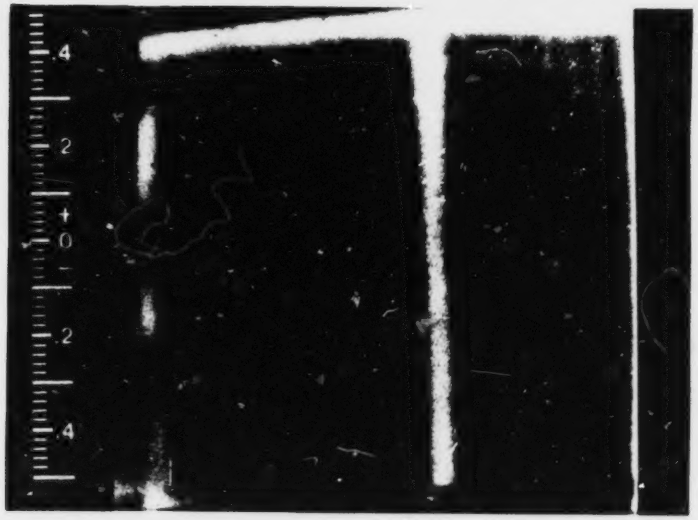
heatscan by THERMAL FOCUS Inc.

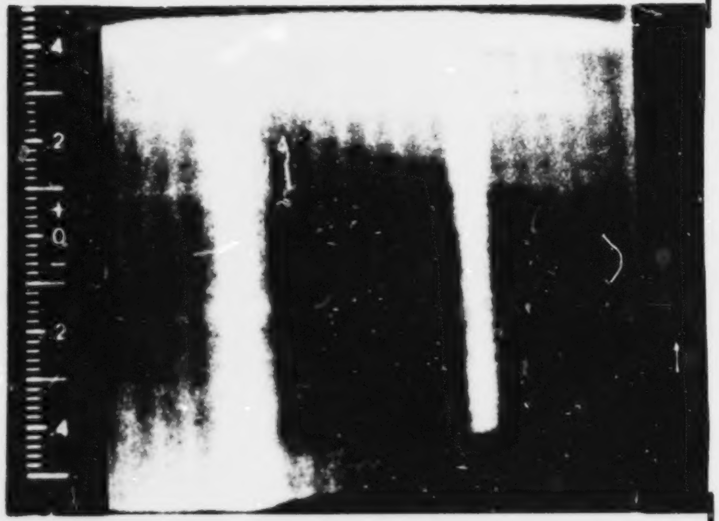
LOCATION :
Tisdale Communiplex
DESCRIPTION :
East wall of curling ri

PROBLEM
IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 17



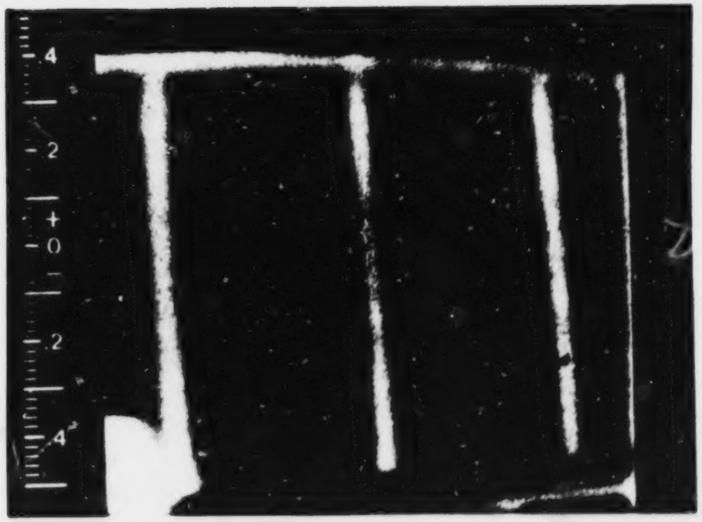


LOCATION :
as above
DESCRIPTION :
as above

PROBLEM
IDENTIFICATION :

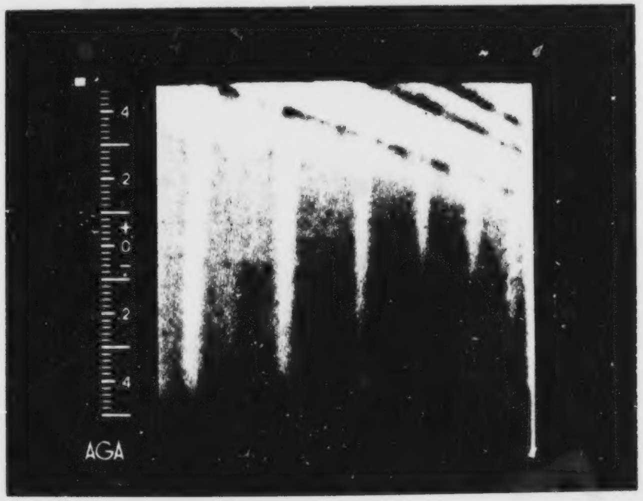
INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

18 PHOTO NO. 19



heatscan by THERMAL FOCUS Inc.

PHOTO.
NO.
20



LOCATION : Tisdale Communiplex

DESCRIPTION : Interior thermogram of east wall in the curling rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION	:	REFER TO COMMENTS BELOW :
INADEQUATE INSULATION	: X	
THERMAL BRIDGING	: X	REFER TO SUMMARY OF FINDINGS :
CONDENSATION	:	

DATA :

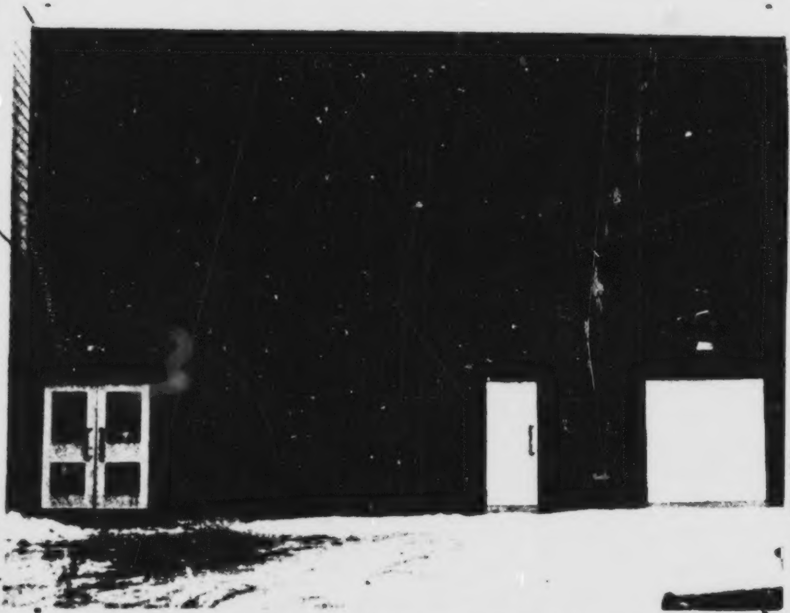
ROOM AIR TEMPERATURE	:	C.
AVERAGE WALL TEMPERATURE	:	C.
AVERAGE WALL TEMPERATURE INDEX	:	
ISOTHERM DIFFERENCE	:	ITU.
TEMPERATURE DIFFERENCE TO FAULT	:	C.
FAULT TEMPERATURE INDEX	:	
AIR INFILTRATION (WHEN RELEVANT)	:	M/S.
RELATIVE HUMIDITY (WHEN REQUIRED)	:	%

SPECIAL COMMENTS : Minor anomaly at wall and ceiling juncture. Cold anomaly from floor extending vertically up half the wall from the patched hole due to cracks in the wall.

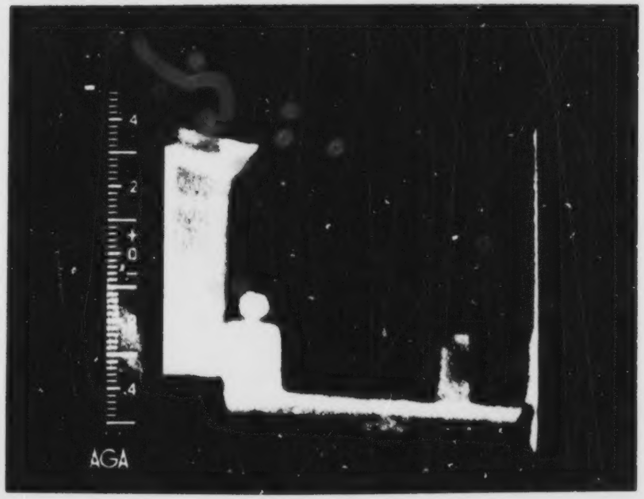
DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO: TT1 05

LOCATION :
Tisdale Communiplex
DESCRIPTION :
Exterior north-east corr
of curling rink.
PROBLEM
IDENTIFICATION :
INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X
PHOTO NO. 21

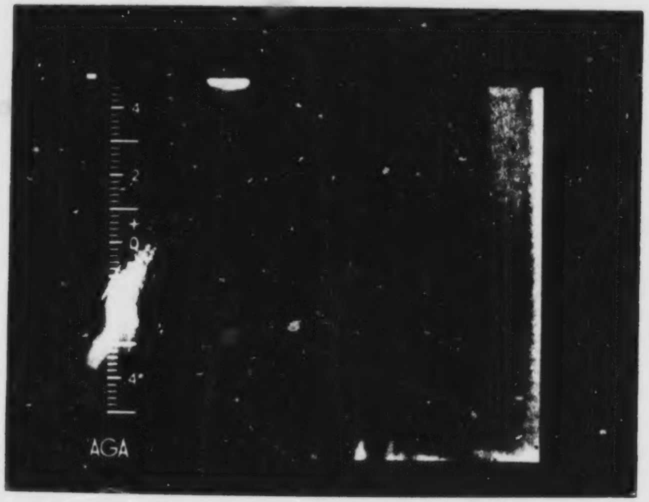


LOCATION :
Tisdale Communiplex
DESCRIPTION :
Exterior south wall
between curling and
hockey rink.
PROBLEM
IDENTIFICATION :
INFILTRATION
INSULATION X (doo
BRIDGING X
CONDENSATION
PHOTO NO. 22



heatscan by THERMAL FOCUS Inc.

PHOTO.
NO.
23



LOCATION : Tisdale Communiplex

DESCRIPTION : Interior thermogram of south-west corner of hockey rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION : x
THERMAL BRIDGING : x
CONDENSATION :

REFER TO COMMENTS BELOW :

REFER TO SUMMARY OF FINDINGS :

DATA :

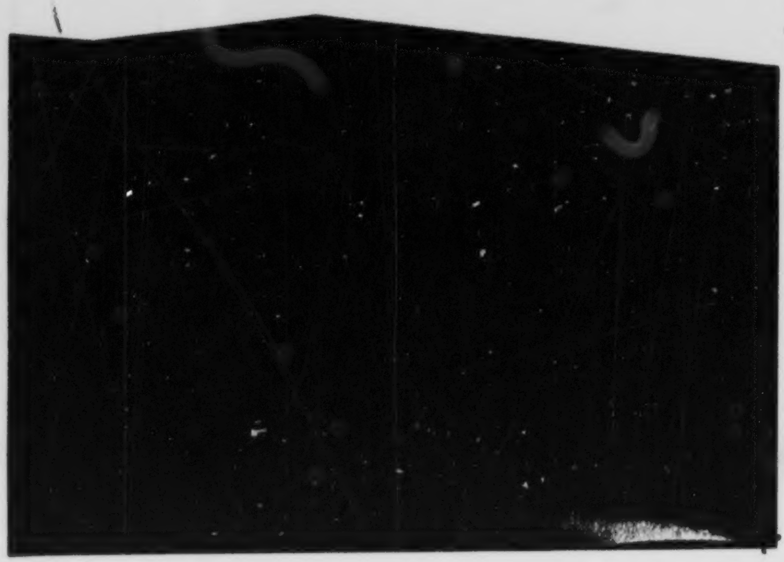
ROOM AIR TEMPERATURE : C.
AVERAGE WALL TEMPERATURE : C.
AVERAGE WALL TEMPERATURE INDEX :
ISOTHERM DIFFERENCE : ITU.
TEMPERATURE DIFFERENCE TO FAULT : C.
FAULT TEMPERATURE INDEX :
AIR INFILTRATION (WHEN RELEVANT) : M/S.
RELATIVE HUMIDITY (WHEN REQUIRED) : %

SPECIAL COMMENTS : The dark, cold section of the wall is the exterior wall; the warm section is separation wall. The difference is due to to the difference in temperature on the other side of the wall.

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO: TFI 05

heatscan by THERMAL FOCUS Inc.



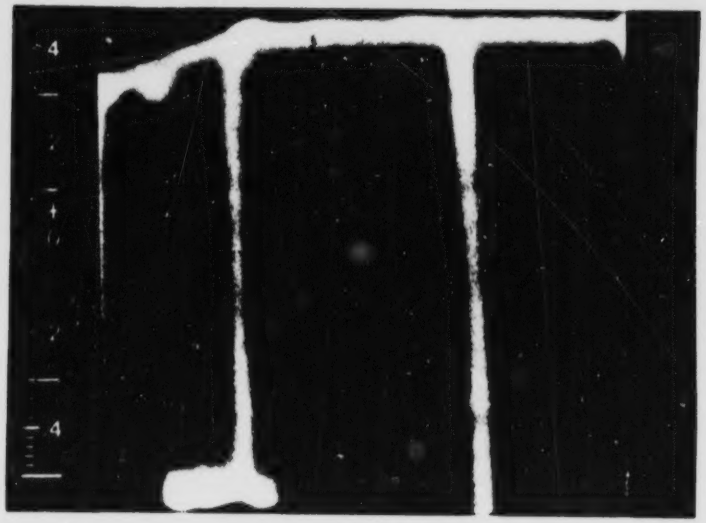
LOCATION :
Tisdale Communiplex

DESCRIPTION :
East wall of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 24



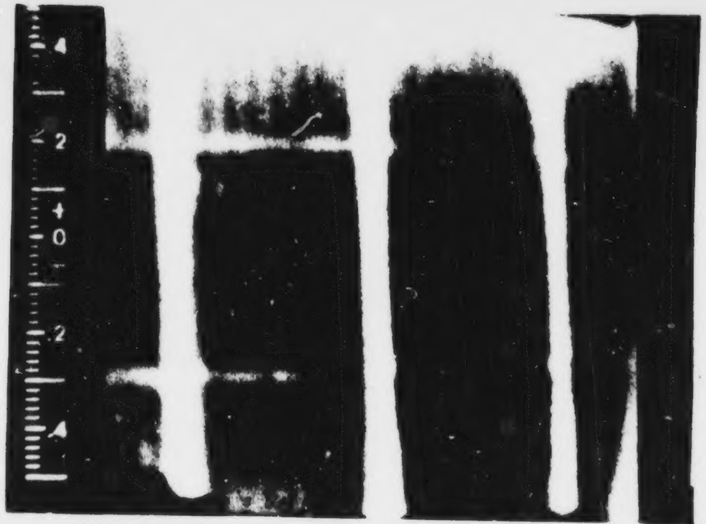
LOCATION :

DESCRIPTION :
as above

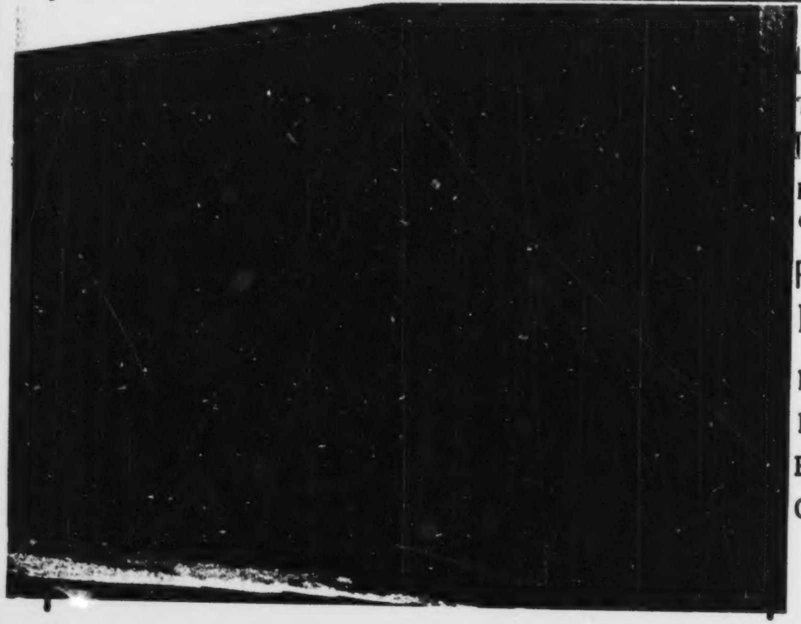
PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

PHOTO NO. 25



HEAT LOSS EVALUATION SHEET NO: TFI 04

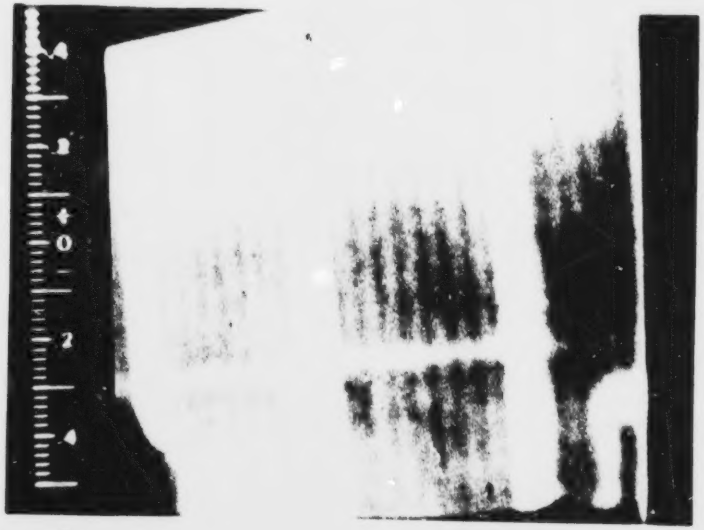


LOCATION :
Tisdale Communiplex
DESCRIPTION :
East face of North-east corner of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 26

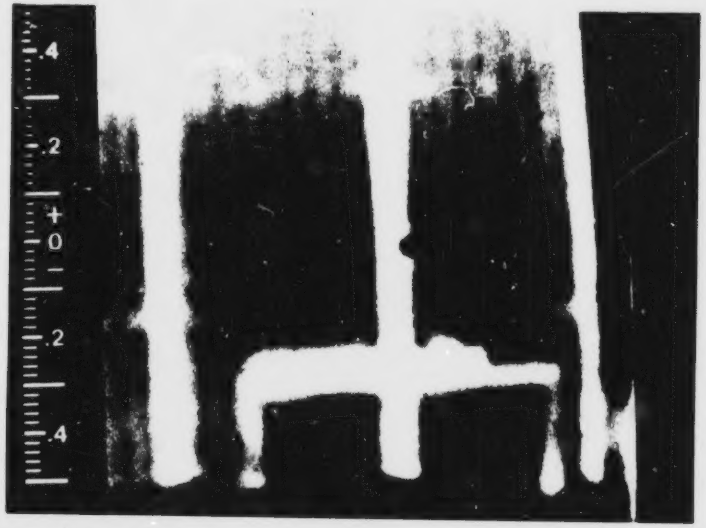


LOCATION :
Tisdale Communiplex
DESCRIPTION :
East wall of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

PHOTO NO. 27



heatscan by THERMAL FOCUS Inc.

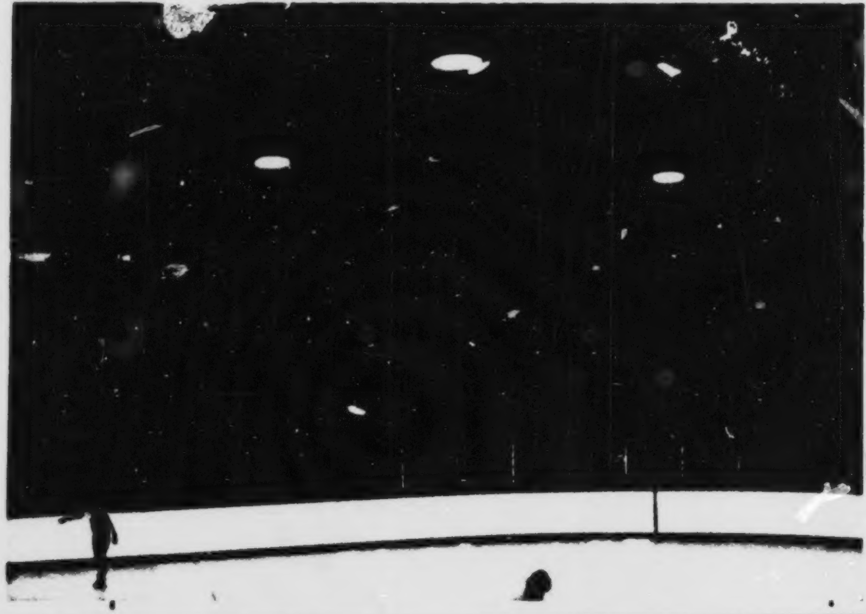
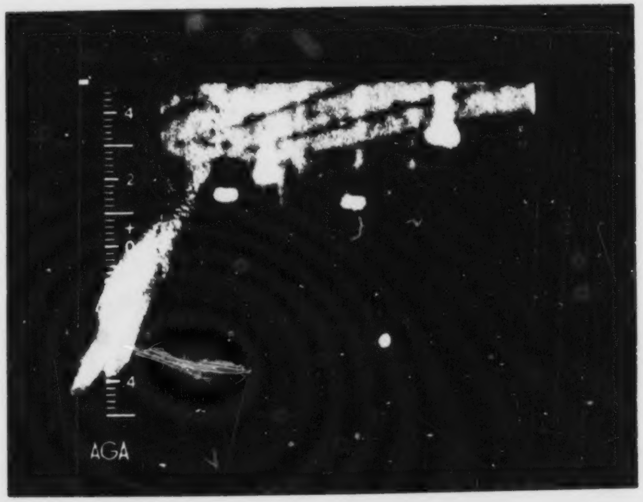


PHOTO. NO.
28



LOCATION : Tisdale Civic Center

DESCRIPTION : Interior thermogram of south-east corner of hockey rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

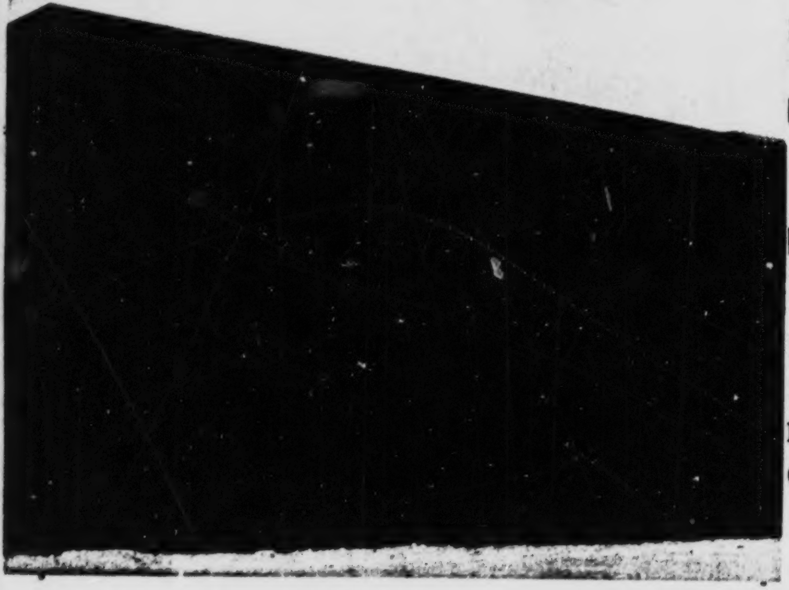
INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

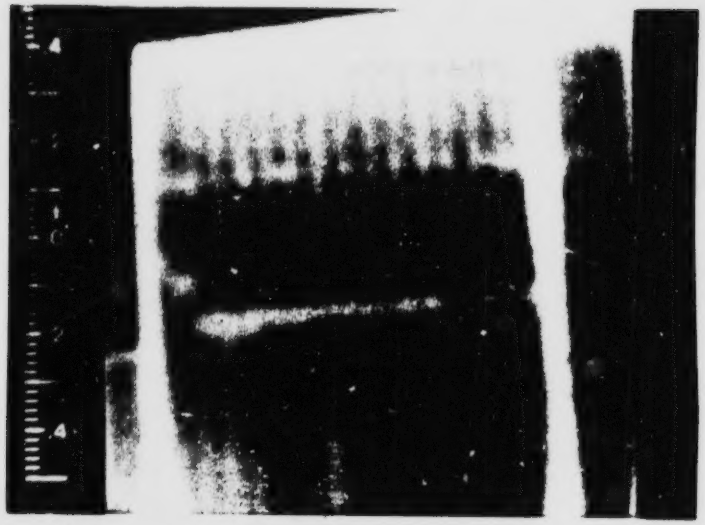
REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Thermal bridging at bond beams and corners. Condensation also is evident.

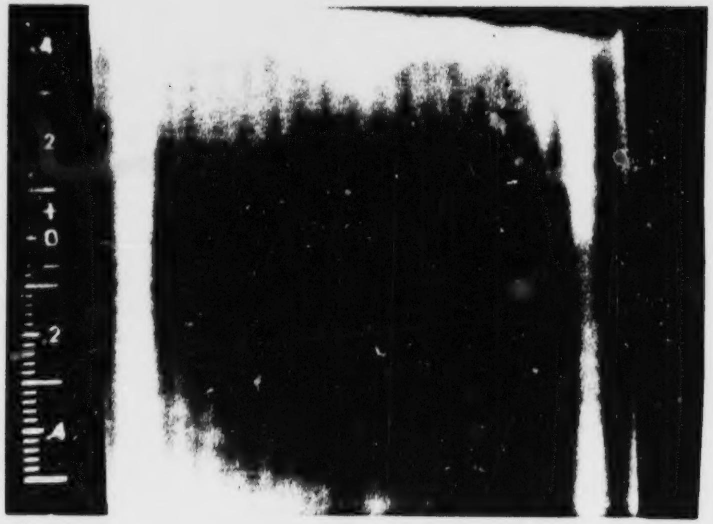
DATE :
CONTRACT NO:



LOCATION :
Tisdale Civic Center
DESCRIPTION :
East wall of hockey rink.
PROBLEM IDENTIFICATION :
INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X
PHOTO NO. 29



LOCATION :
as above
DESCRIPTION :
PROBLEM IDENTIFICATION :
INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X
30 PHOTO NO. 31



heatscan by THERMAL FOCUS Inc.

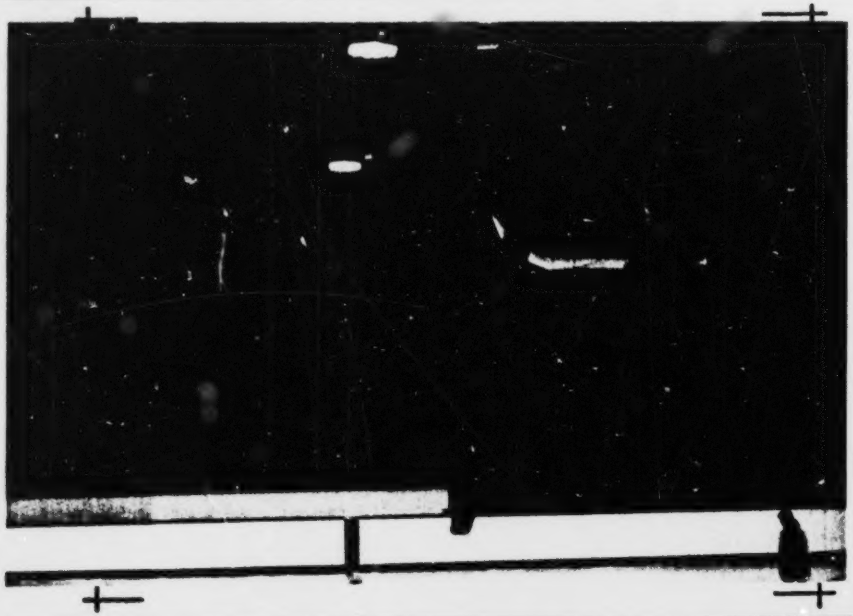
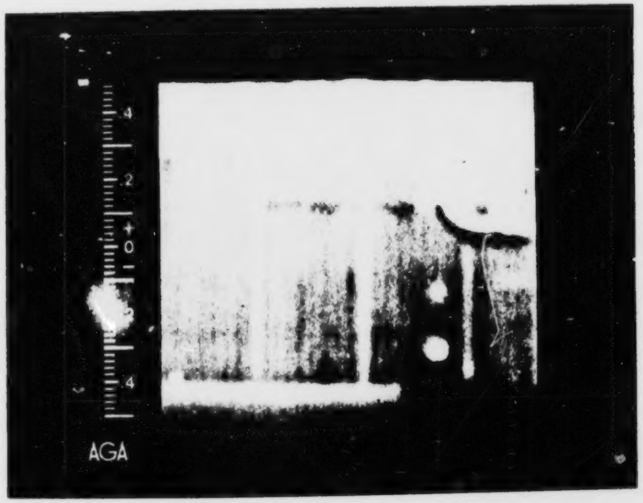


PHOTO.
NO.
32



LOCATION : Tisdale Civic Center

DESCRIPTION : Center of interior east wall.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

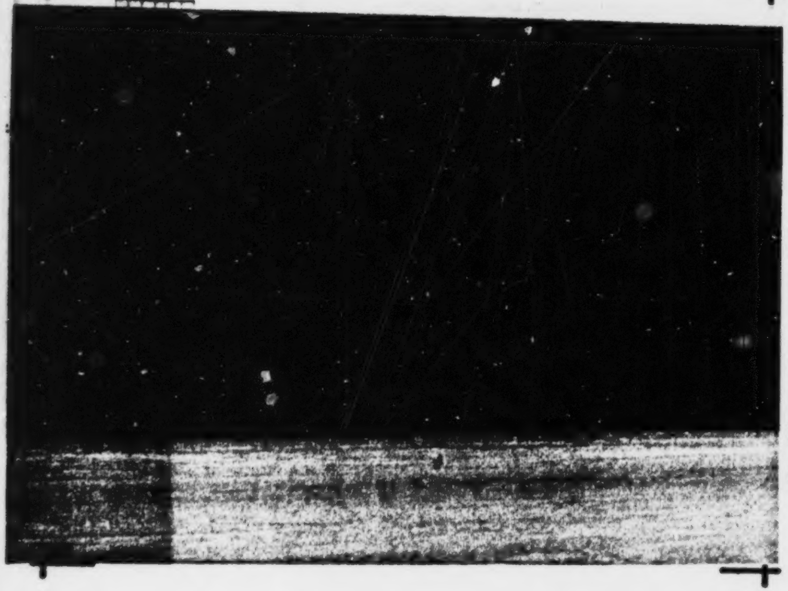
REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Air infiltration at exit. The vertical anomalies to the left of the exit are due to cracks in the wall.

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO; TFI 05

heatscan by THERMAL FOCUS Inc.



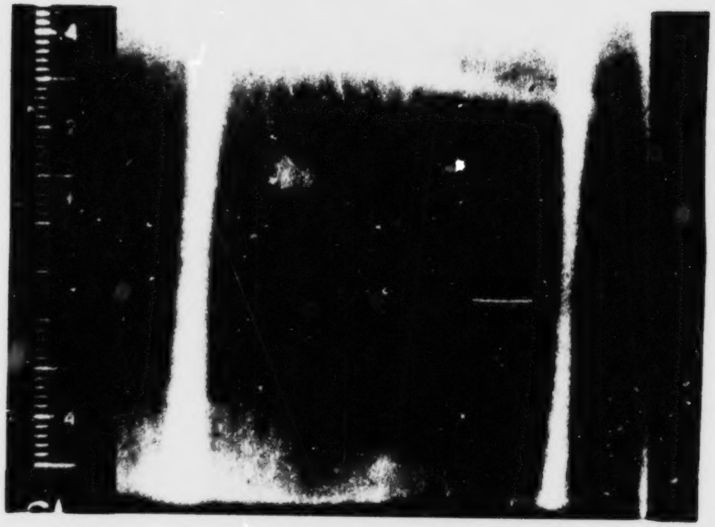
LOCATION :
Tisdale Civic Center

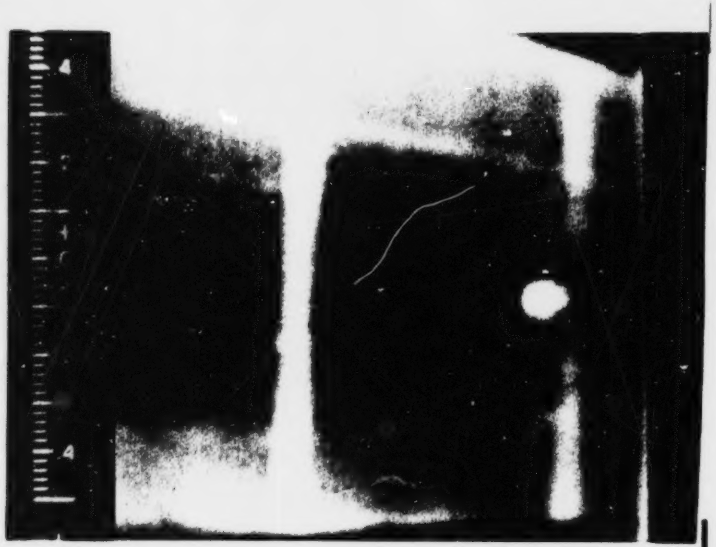
DESCRIPTION :
East wall of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 33





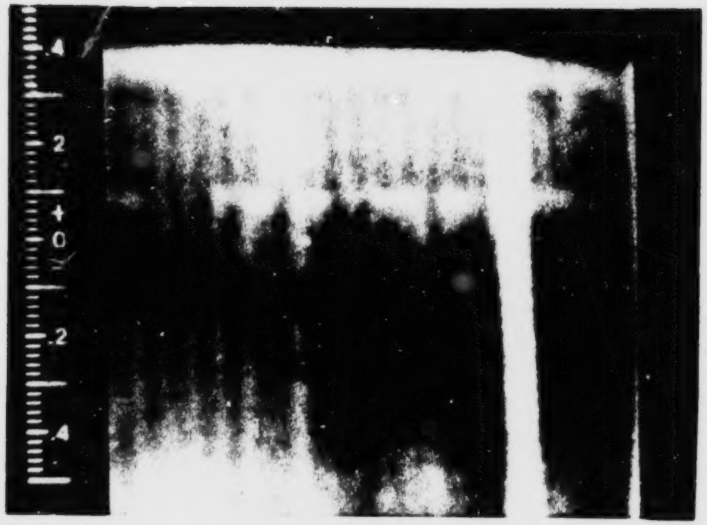
LOCATION :
as above

DESCRIPTION :

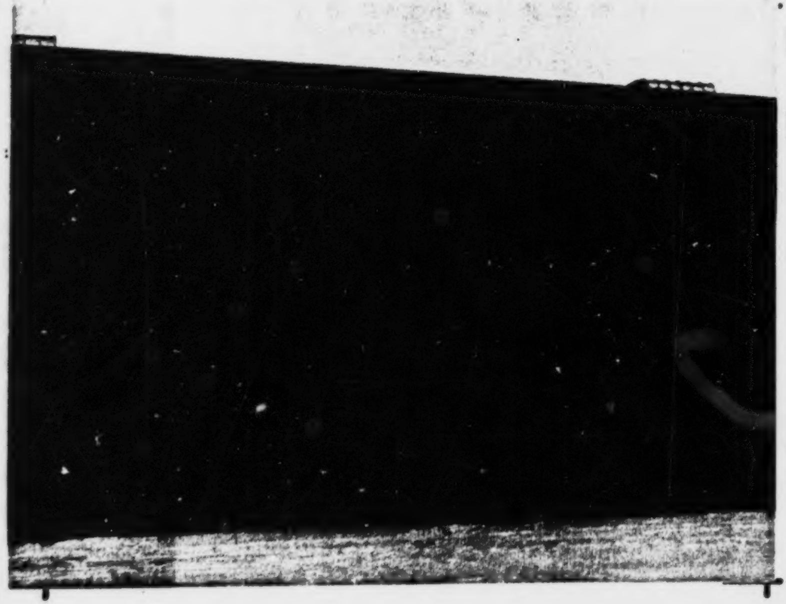
PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

34 PHOTO NO. 35



HEAT LOSS EVALUATION SHEET NO: TFI 04

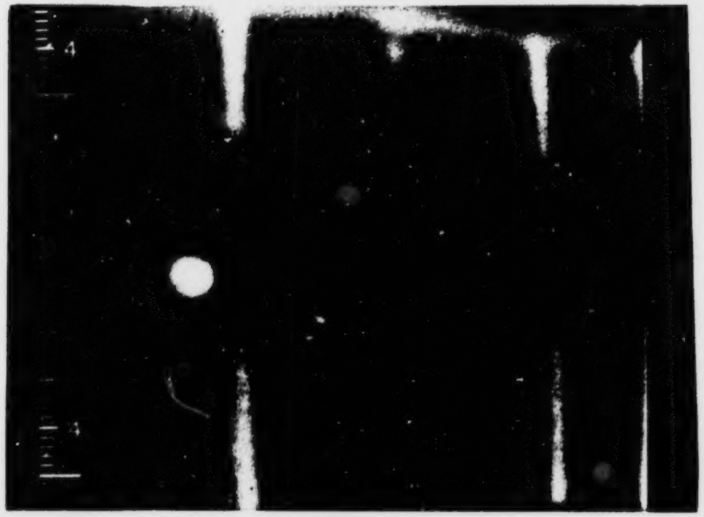


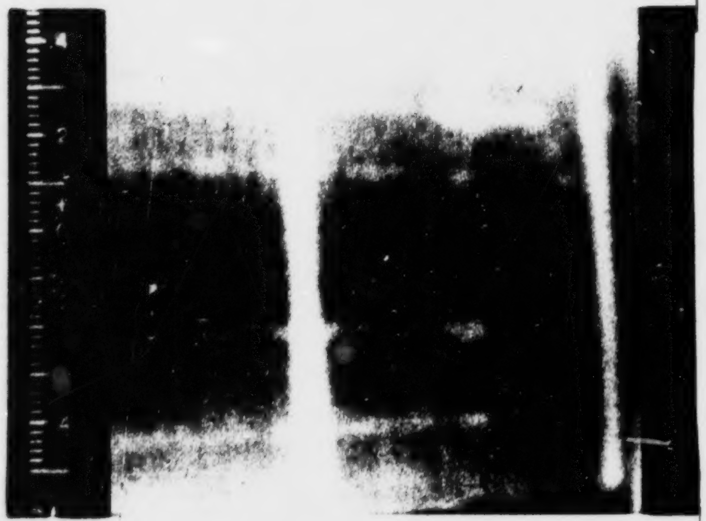
LOCATION :
Tisdale Civic Center
DESCRIPTION :
East wall of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 36





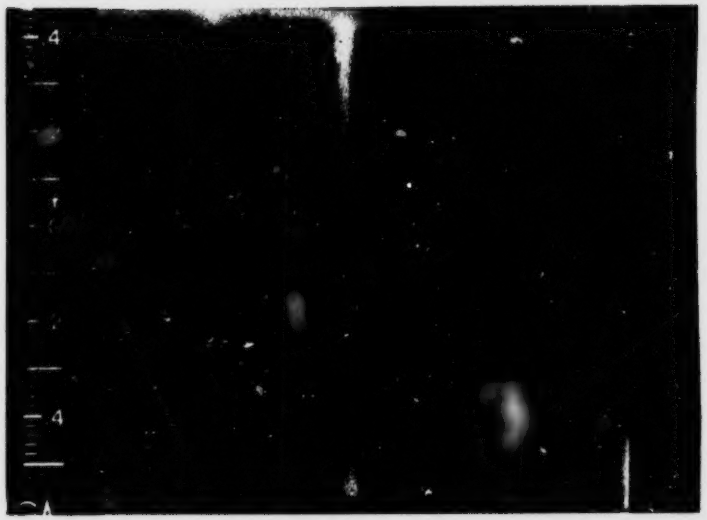
37

LOCATION :
as above
DESCRIPTION :

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

PHOTO NO. 38



heatscan by THERMAL FOCUS Inc.

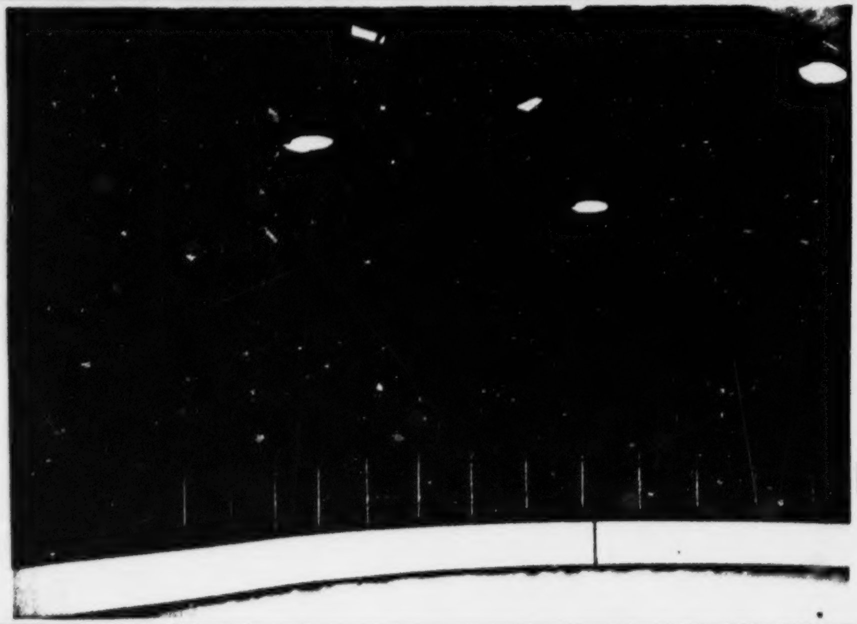
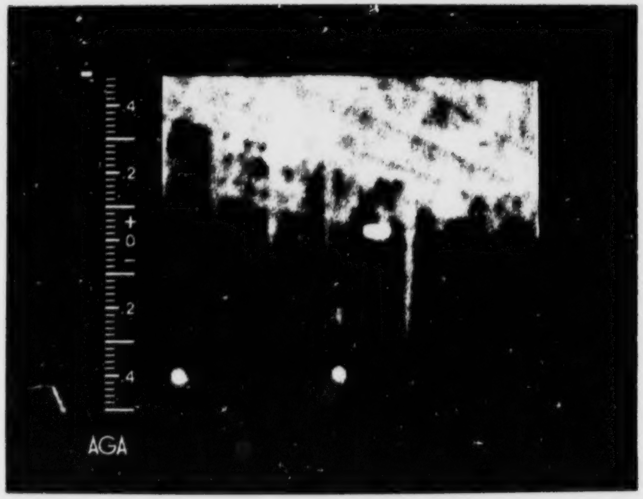


PHOTO. NO. 39



LOCATION : Tisdale Civic Center

DESCRIPTION : Interior north-east corner of hockey rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

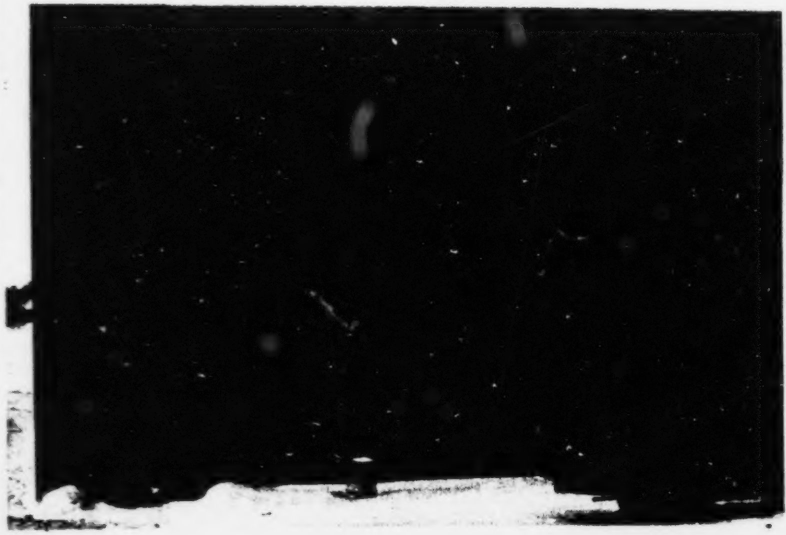
COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Thermal bridging at bond beams and garage door header. Condensation evident on north wall as irregular thermal anomalies.

DATE :
CONTRACT NO:

HEAT LOSS EVALUATION SHEET NO; TFI 05



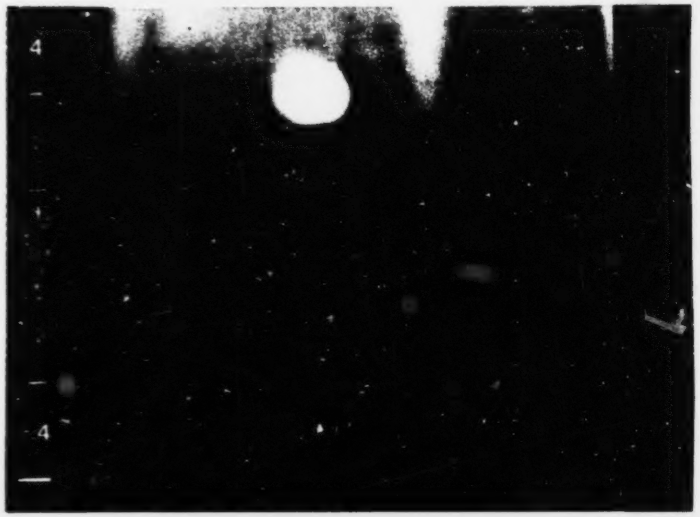
LOCATION :
Tisdale Civic Center

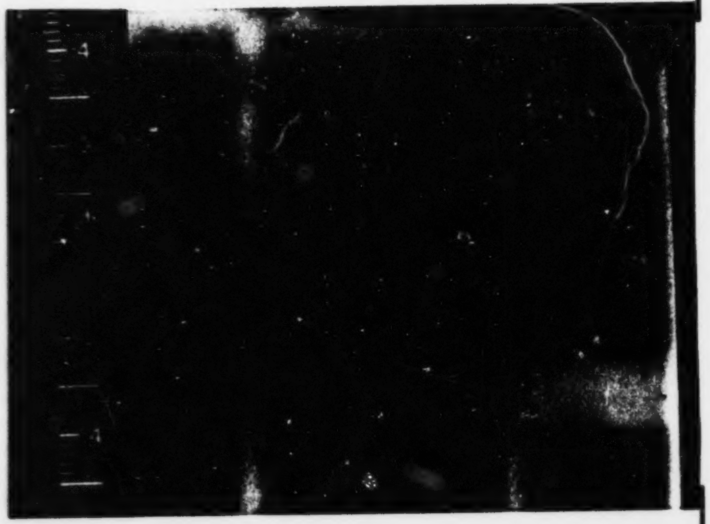
DESCRIPTION :
North end of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 40





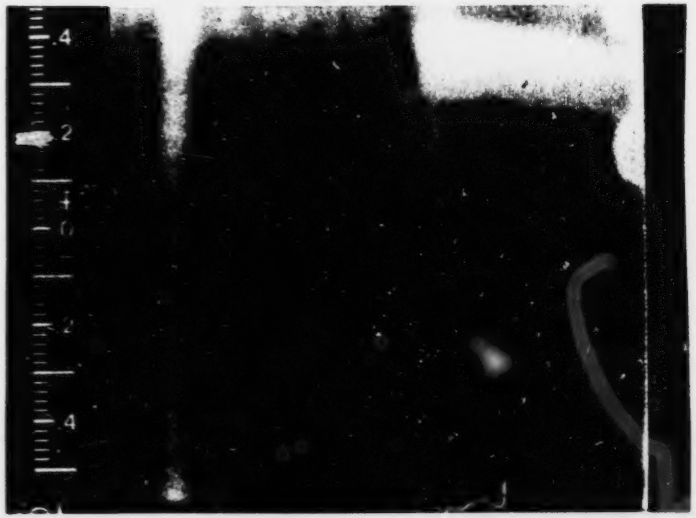
LOCATION :
as above

DESCRIPTION :

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

41 PHOTO NO. 42



heatscan by THERMAL FOCUS Inc.

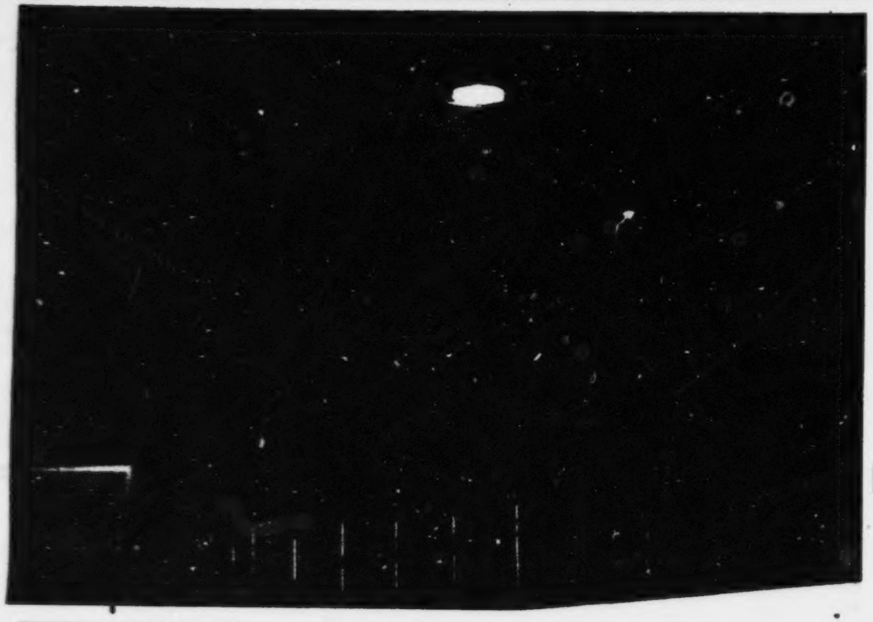
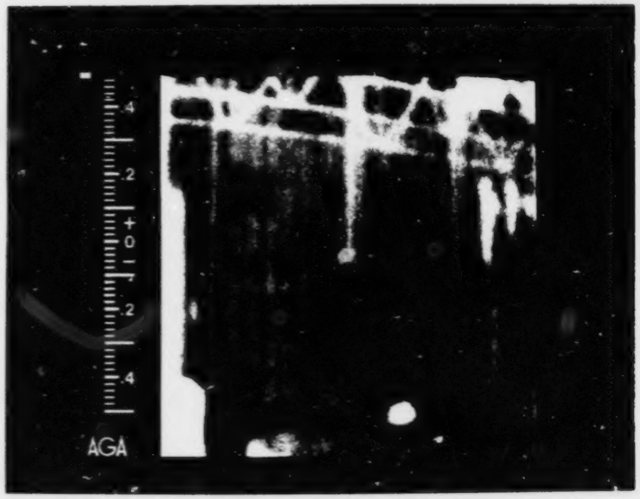


PHOTO.
NO.
43



LOCATION : Tisdale Civic Center

DESCRIPTION : North-east corner of hockey rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION : X
THERMAL BRIDGING : X
CONDENSATION : X

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

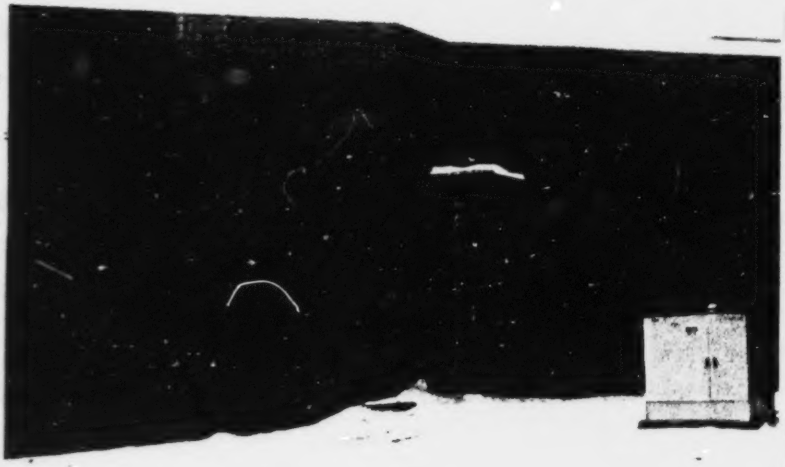
COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Thermal bridging at beams and door header. Infiltration at the door. Condensation evident as irregular thermal anomalies. See external thermograms.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

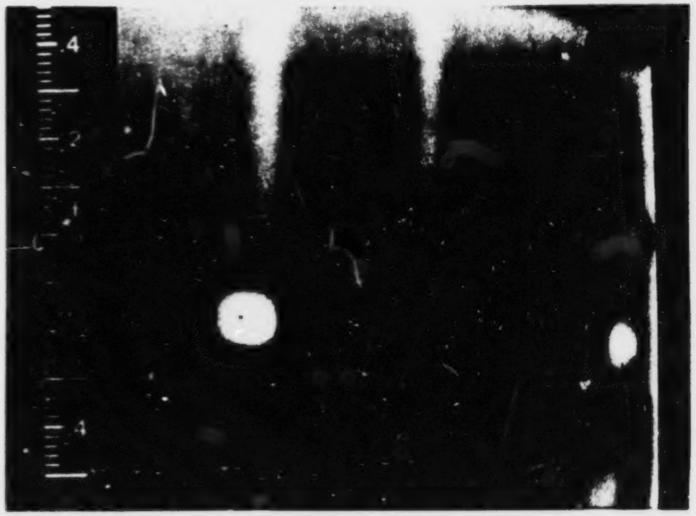


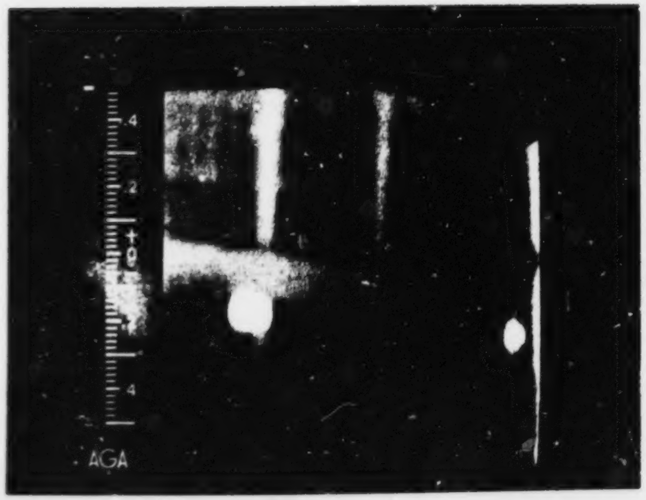
LOCATION :
Tisdale Civic Center
DESCRIPTION :
North end of hockey rink.

PROBLEM IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING :
CONDENSATION :

PHOTO NO. 44



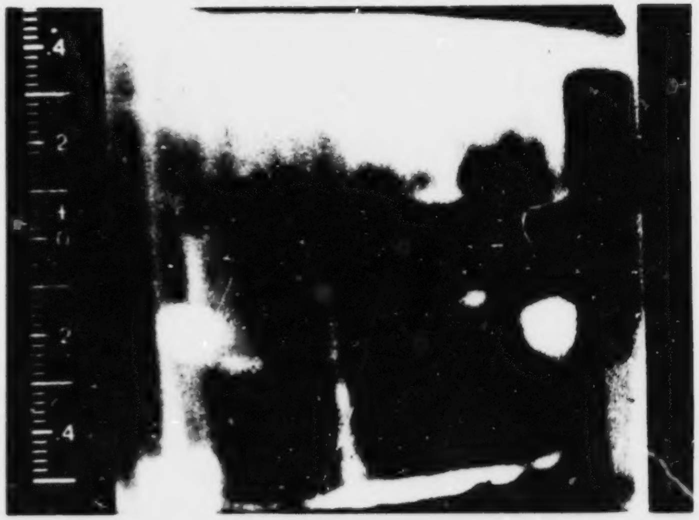


LOCATION :
as above
DESCRIPTION :

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION X

45 PHOTO NO. 46



LOCATION :
Tisdale Civic Center
DESCRIPTION :
Juncture of Center
to Tisdale School.

PROBLEM
IDENTIFICATION :

INFILTRATION :
INSULATION :
BRIDGING : X
CONDENSATION : X

PHOTO NO. 47

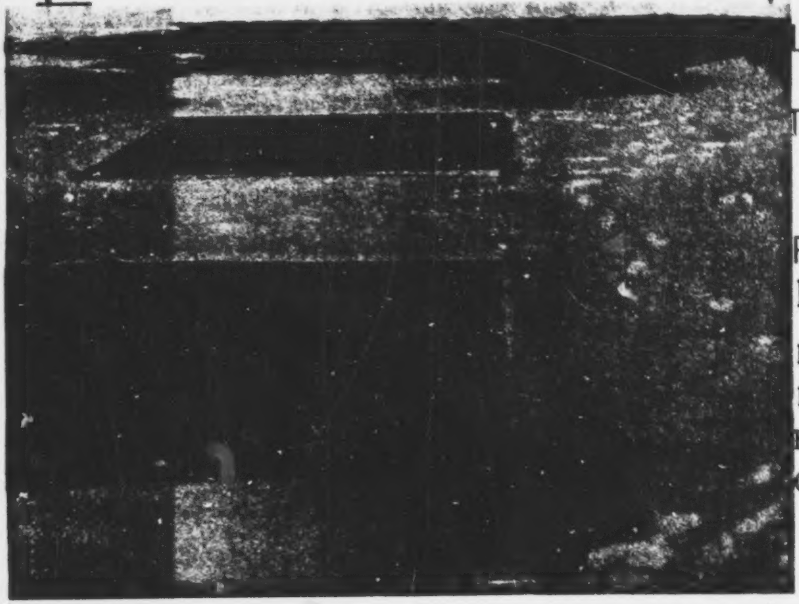
LOCATION :
as above
DESCRIPTION :

PROBLEM
IDENTIFICATION :

INFILTRATION
INSULATION X
BRIDGING X
CONDENSATION X

48 PHOTO NO. 49

heatscan by THERMAL FOCUS Inc.

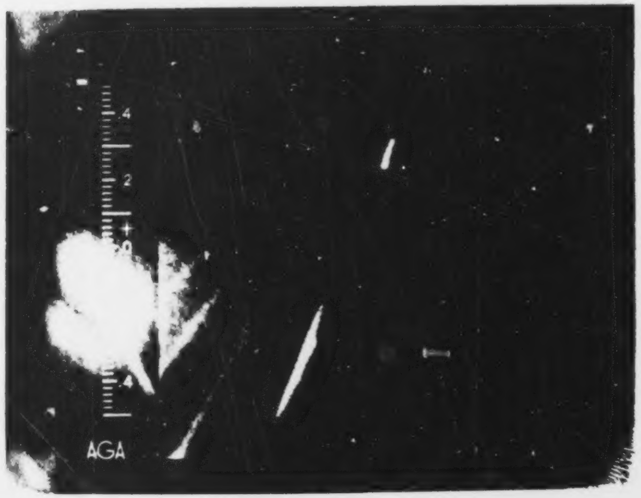


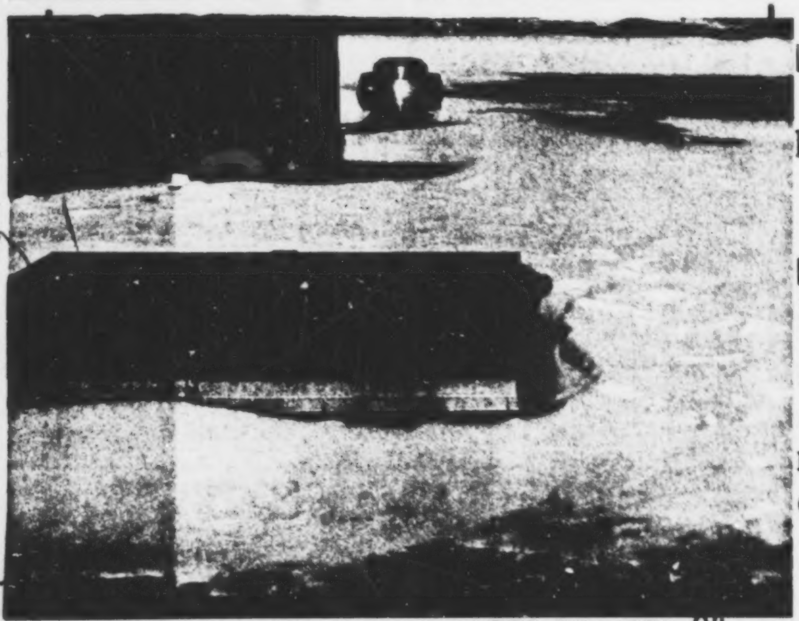
LOCATION :
Tisdale Civic Center
DESCRIPTION :
External view of Foyer skylights.

PROBLEM IDENTIFICATION :

INFILTRATION : X
INSULATION :
BRIDGING :
CONDENSATION :

PHOTO NO. 50



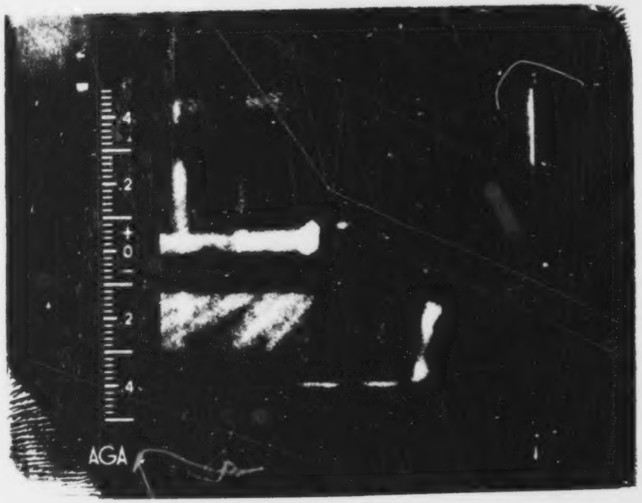


LOCATION :
as above
DESCRIPTION :

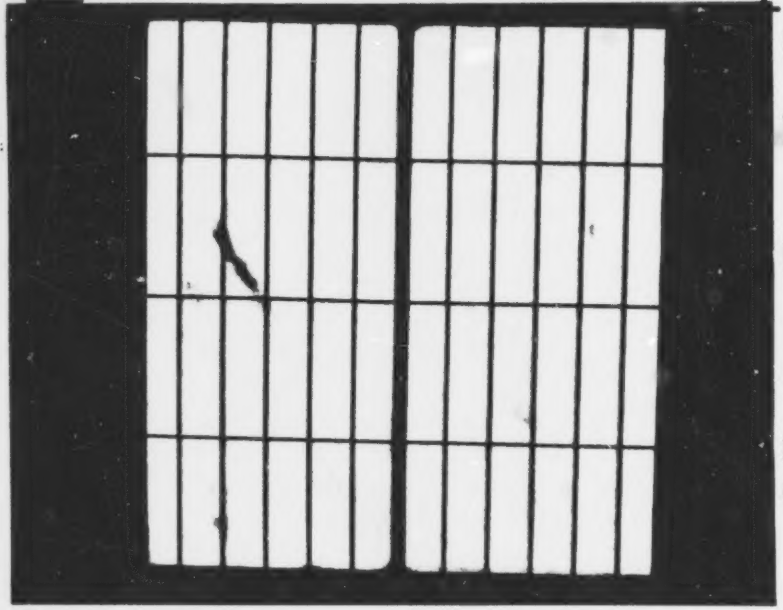
PROBLEM IDENTIFICATION :

INFILTRATION X
INSULATION
BRIDGING
CONDENSATION

PHOTO NO. 51



HEAT LOSS EVALUATION SHEET NO: TFI 04



LOCATION :
Tisdale Civic Cente
DESCRIPTION :
Foyer skylight.

PROBLEM
IDENTIFICATION :

INFILTRATION : X
INSULATION : X
BRIDGING : X
CONDENSATION :

PHOTO NO. 52

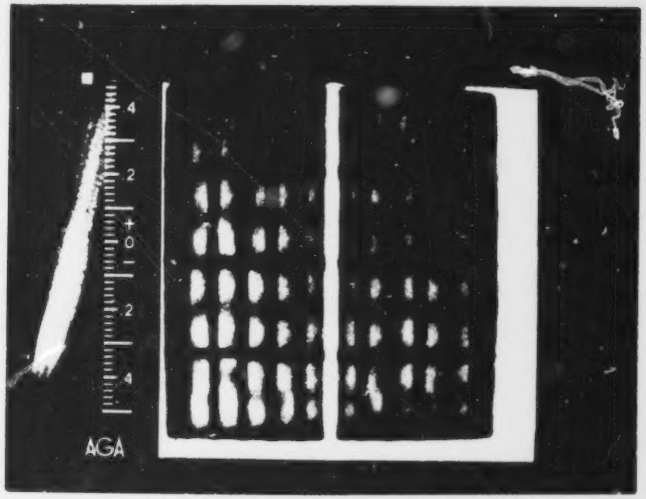
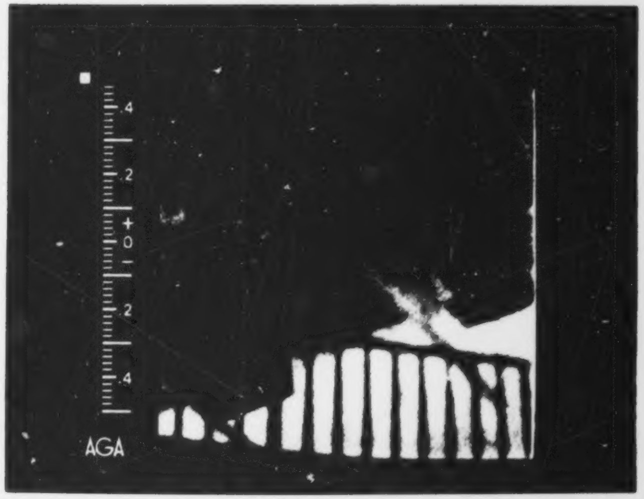


Photo not available

LOCATION :
as above
DESCRIPTION :
Roof unit in foyer
(typical)
PROBLEM
IDENTIFICATION :

INFILTRATION X
INSULATION
BRIDGING
CONDENSATION

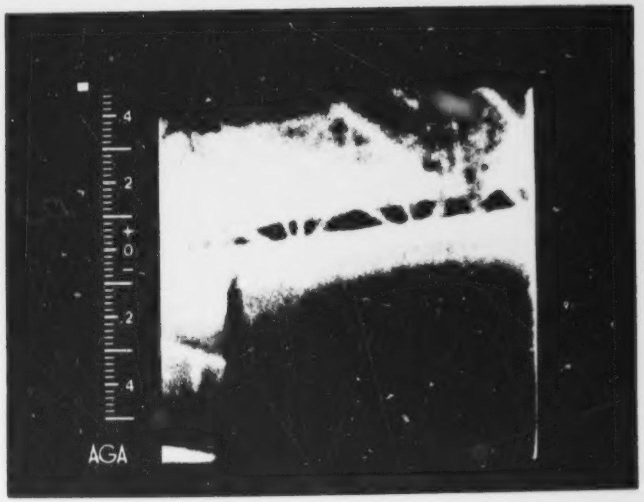
PHOTO NO. 53



HEAT LOSS EVALUATION SHEET NO: TF1 04

heatscan by THERMAL FOCUS Inc.

PHOTO.
NO.
54



LOCATION : Tisdale Civic Center

DESCRIPTION : Upper north-east corner of foyer area.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

REFER TO COMMENTS BELOW : X.
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Distinct anomaly at structural member.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

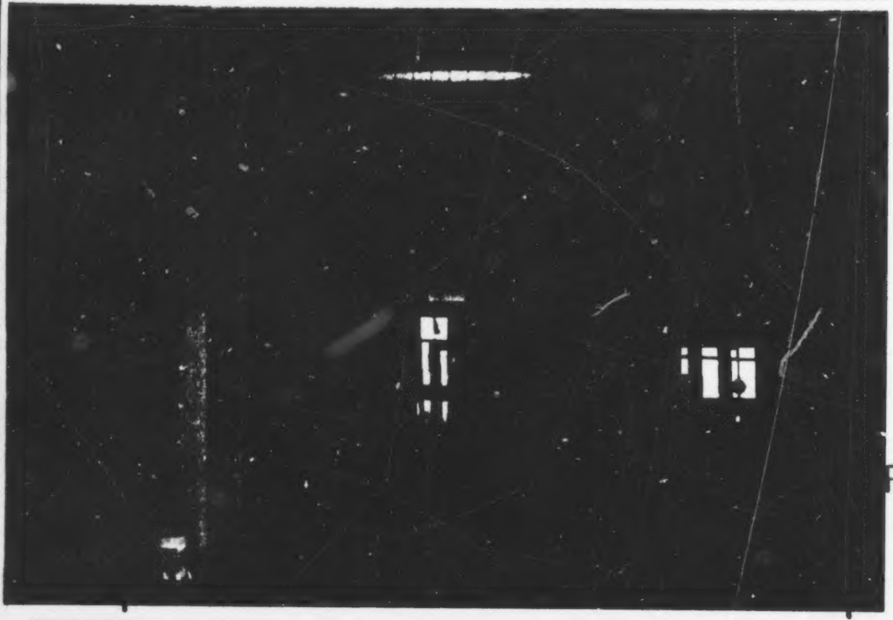
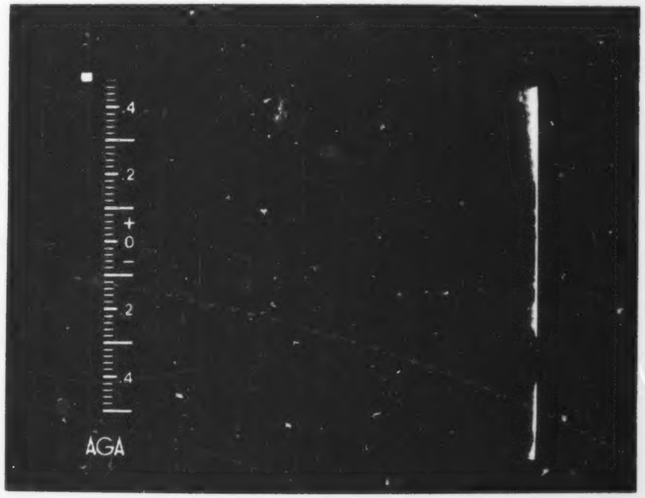


PHOTO.
NO.
55



LOCATION : Tisdale Civic Center

DESCRIPTION : Arena entrance from Foyer.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

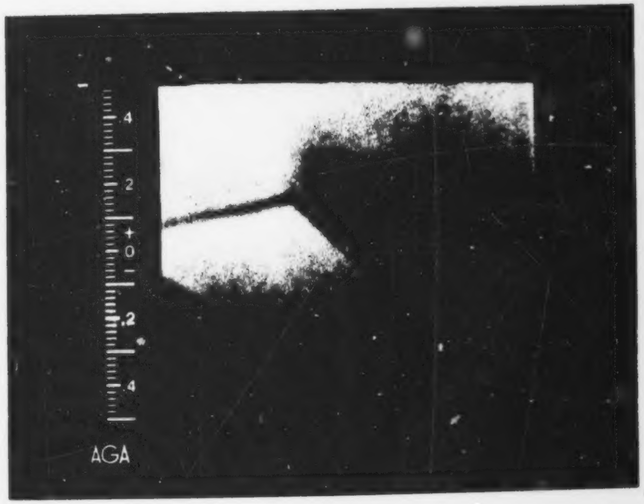
REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Air infiltration at foyer door seals; thermal bridging dominently at structural member.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

PHOTO.
NO.
56



LOCATION : Tisdale Civic Center

DESCRIPTION : Upper ceiling just outside clubhouse exit.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -7° C.

COMMENTS :

REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Thermal anomaly unexplained; possibly abberation caused by viewing angle (Infrared reflection) but warrants an inspection of insulation integrity above.

DATE :
CONTRACT NO:

II Thermography

The technique of measuring the amount of invisible infrared radiation (invisible heat) is called thermography. We accomplish this by using a highly specialized camera that converts the infrared radiation into a visible television like picture. The picture is then photographed, giving us a permanent record of the object under investigation. This photograph is called a thermogram.

Thermograms, in conjunction with additional data collected on site are used to evaluate the condition of the roof under study.

The AGA 782 Thermovision system used by Thermal Focus Incorporated can measure temperatures from -20 C to +2000 C. It also detects and displays temperature differences as small as 0.1 C.

How to read a Thermogram

The black and white pictures in your report are the thermograms that indicate the various temperature levels of the roof.

The thermograms are in various shades of grey, representing different temperature levels. On the thermograms black represents a cold area, whilst the white represents the warm areas. In the roofing survey, the areas of the roof that have moisture in the insulation will show up as the light or white parts. This is due to the fact that the roof was allowed to soak under sun conditions prior to the survey, allowing the moisture to absorb heat from the sun. The survey was then conducted in the early evening after the roof surface was given a chance to cool to or below the ambient temperature. As the moisture in the insulation retains its heat for a longer period of time relative to the surface temperature of the roof, one can then determine the areas of damage from the thermogram.

Thermographic Terminology

Isotherm:	A means of enhancing areas of similar surface temperature. The isotherm function shows up on the thermogram as a series of white dots.
Dual Isotherm:	Two isotherm functions displayed simultaneously.

Air Infiltration:	The unintended free movement of outside air to the inside of the structure.
Air Exfiltration:	The unintended free movement of inside air to the outside environment.
Thermal Bridging:	The result of the use in construction of materials that give rise to local heat transfer rates different from the average rate; as in the care of wall studs.

3.0 General Comments

1. Thermal Focus Incorporated conducted an infrared thermographic scan on February 23 and March 17 1983. On the night of February 23, the west face of the recreation center was scanned, as well as selected interior locations of the structure. This investigation was performed from 11:30 a.m. till 3:00 p.m. The temperature was -7°C with westerly winds of 10 - 15 km/hour. On March 17 the remaining exterior walls of the structure were scanned, and the thermographic circuit of the structure placed on tape. The testing was performed from 11:30 a.m. to 2:30 p.m., at the temperature of -15°C and calm winds.

2. The intensity of a thermal anomaly in one thermogram cannot be compared to the intensity in another thermogram. The relative heat loss of an area can only be compared to the heat loss of an area in the same thermogram.

3. All thermal anomalies were recorded as hard-copy thermograms in either polaroid film or 35 mm prints (as represented in this report). The exterior scans were recorded on video tape for retrieval at a later date for discussion or demonstration purposes.

4.0 Specific Comments

4.1 Exterior Walls

1. The entire structure exhibits common faults seen in many building of similar construction. Thermal bridging at structurals and bond beams is evident in virtually all exterior thermograms. This problem is exhibited as a vertical anomaly at regular intervals of approximately 20 feet. The horizontal bond beams also show thermal bridging, although not as intense as the vertical structural beams.

2. The horizontal roof structural steel and the horizontal bond beams at some locations exhibit greater heat loss than expected. The increased thermal transfer is caused by condensation within the wall structure decreasing the insulation value of the wall. The warm humid inside air condenses on the cold uninsulated structural beams. The dew drips off the steel and onto the insulation or rises as vapour into the insulation above. This eventually causes total degradation and increased heat transfer. Thermograms 14, 15, 16.

4.1 Exterior Walls (continued)

3. The main entrance wall of this complex shows many anomalies over the surface at irregular intervals. Part of this heat loss is due to thermal bridging at corners and edges. The other anomalies are due to condensation within the wall. The warm humid air from inside will condense on the cold window frames and drip into the insulation. This problem is increased if the humid air infiltrates into the insulation through tears or holes in the vapour barrier. This will eventually cause total degredation of the insulation within the wall. The efflorescence on the brick exterior is evidence of moisture migrating through the brick to the outside. Thermogram 1 - 6.

4. The east wall of curling rink shows an anomaly of moderate area and intensity. This seems to be due to a crack in the wall, and related to the patched hole in the wall. The insulation in the brick may have dropped out, or water vapour may have risen into the insulation, thus lowering the thermal resistance. Internal Thermogram 20. External Thermogram 19.

5. The school wall near the east junctureof the school and the center exhibits a major problem. The thermograms demonstrate the high heat loss from the area. The efforescence on the wall indicates the lack of vapour barrier in the structure, allowing migration of of moisture to the outside. Thermograms 47, 48, 49.

4.2 Skylights

The external thermograms of the foyer skylights reveal the problem of air exfiltration from the skylight perimeter. This is supported by the melted snow around the skylight. The temperature of the skylights deck is -7.0°C, the skylight temperature is -6.6°C, the temperature of the flashing is 1.2°C. The higher flashing temperature is due to the exfiltrating air. Thermogram 50, 51, 52.

Interior

1. The entrance to the arena shows air infiltration out of the arena doors into the foyer area. There is also thermal bridging apparent at the structural member to the left of the door. Thermogram 55.

2. The roof units show thermal anomalies due to the possible air infiltration and thermal bridging where the unit mounts to the roof. Thermogram 53.

4.3 Interior (continued)

The light fixture surrounding in the ceiling just outside the entrance to the upper clubroom and bar expresses a thermal anomaly. The reason for this anomaly is not apparent, and is likely an aberration due to infrared reflection, but it does deserve an inspection for possible insulation or air draft effect.

5.0 Conclusions

The building exhibits certain thermal characteristics common to buildings of similar construction. In particular the exterior walls display anomalies due to thermal bridging at structural members that is significant in intensity and, cumulatively, appreciable in extent. Condensation appears to be evident at certain locations and to be causing degradation of the wall insulation; a feature consequent upon air penetration of the vapour barrier. Generally these latter faults may arise due to lack of attention to detail by the contractors or in the detailing of the design.

Whilst certain other thermal irregularities are revealed by this infrared survey and are documented in this report the repeated wall faults from thermal bridging and lowered thermal resistance, due both to direct insulation default and the consequence of condensation from interstitial air movement, are the dominent thermal features of this complex.

ENERGY TECHNOLOGY BRANCH

SASKATCHEWAN ENERGY & MINES

Thermal Focus Incorporated

THERMOGRAPHIC SURVEY

OF THE

HUMBOLDT UNIPLEX

MARCH 1983

ENERGY MANAGEMENT — THERMOGRAPHIC SPECIALISTS

Thermal Focus Incorporated

BOX 426, SUB 6, SASKATOON, SASK. S7N 0W0
Phone (306) 374-6300

Thermal Focus Incorporated is pleased to forward this report of the inspection of Humboldt Uniplex.

A full peripheral external infrared scan was made of this complex on March 23rd 1983 from 10.00p.m. to 12.00p.m. Comprehensive photographic documentation was completed subsequently. This report identifies the location and nature of thermal deficiencies in the building enclosure of Community Centre, Arena, Curling Rink and Lobby.

Singular details are addressed by statement on each thermogram sheet. More general details and elements common to the various individual thermal expressions are dealt with under the headings of General and Specific Comments respectively. Under the actual conditions of the inspection this complex displayed few, and relatively minor, thermal deficiencies and the dominent anomalies thus were:

(a) The exterior juncture of the walls and roof show various thermal defects, primarily in the Community Centre and with a certain repeating pattern, that appear sufficiently local to be attributed to air exfiltration.

(b) The doors of the complex show moderate heat loss due to air exfiltration and thermal bridging.

Thermal Focus Incorporated

CONTENTS

Introduction

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1.0 External Thermographic Survey

  (a) Master data sheet

  (b) Location of infrared survey stations

  (c) Thermograms

2.0 Thermography and Related Terminology

3.0 General Comments

4.0 Specific Comments

5.0 Conclusions

6.0 References

heatscan by THERMAL FOCUS Inc.

MANAGEMENT DATA:

CLIENT	: Energy Technology Branch : Saskatchewan Energy & Mines	DATE : TIME :	23rd March 1983. 22.00 - 24.00.
ADDRESS	: 1914 Hamilton Street : Regina, Saskatchewan : S4P 4V4	QUOTATION NO. : REPORT NO. :	
TELEPHONE NO.	:	PURCHASE NO. : INVOICE NO. :	

CONSTRUCTION DATA:

BUILDING DESCRIPTION : Recreational Complex with hockey and curling rink, with large foyer area and various meeting rooms.

BUILDING AGE :

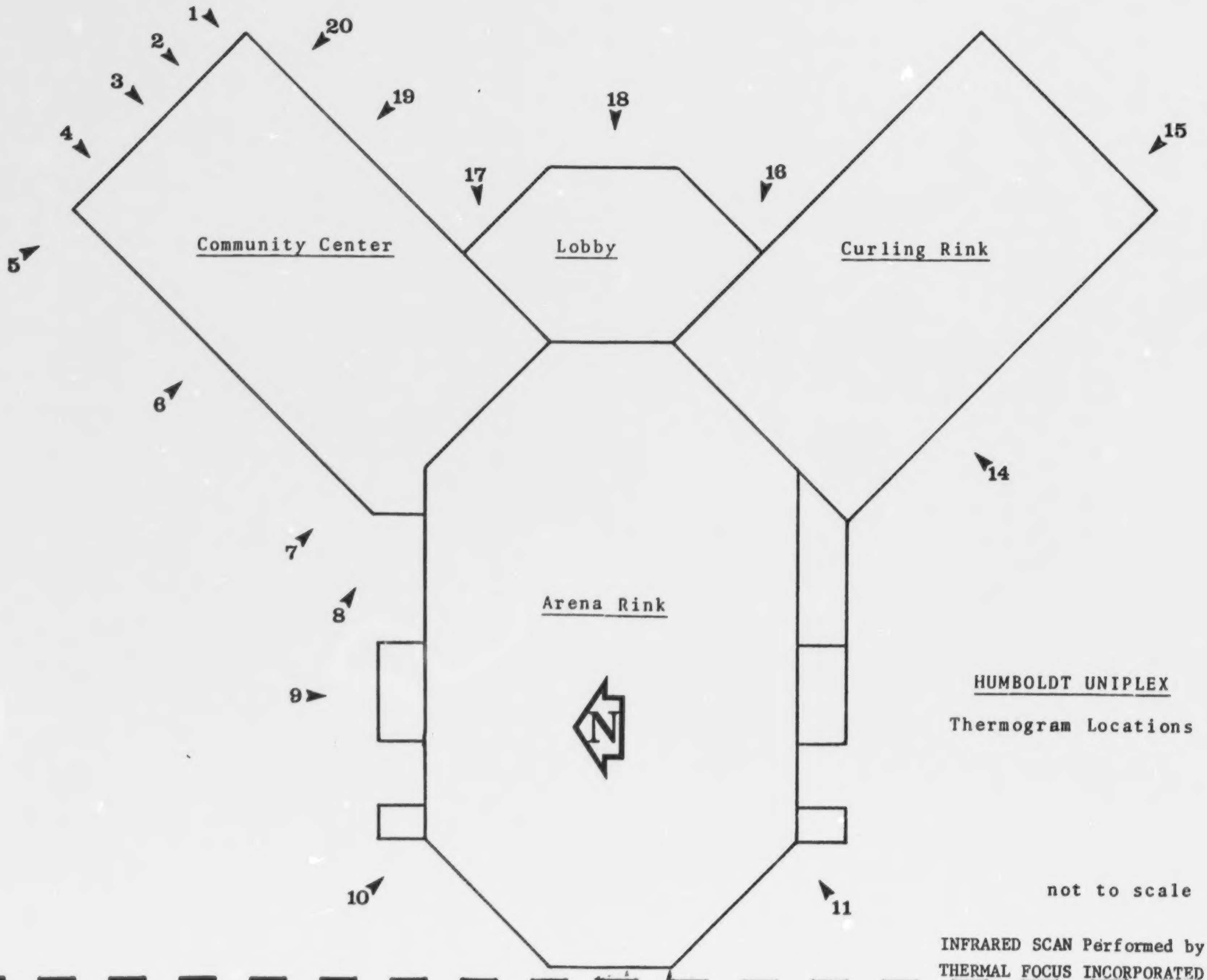
HEAT DISTRIBUTION SYSTEM : Ducted forced air

RELATED HEAT LOSS HISTORY :

ENVIRONMENTAL DATA:

OUTSIDE AIR TEMPERATURE	:	-4°	C.
WIND DIRECTION	:	SE	
WIND SPEED	:	9 km/hr	
CLOUD COVER	:	100%	%
PRECIPITATION	:	nil	

ADDITIONAL COMMENTS:


1
2
3
4
5
6
7
8
9
10
11
14
15
16
17
18
19
20
Community Center
Lobby
Curling Rink
Arena Rink
N

HUMBOLDT UNIPLEX

Thermogram Locations

not to scale

INFRARED SCAN Performed by
THERMAL FOCUS INCORPORATED

heatscan by THERMAL FOCUS Inc.

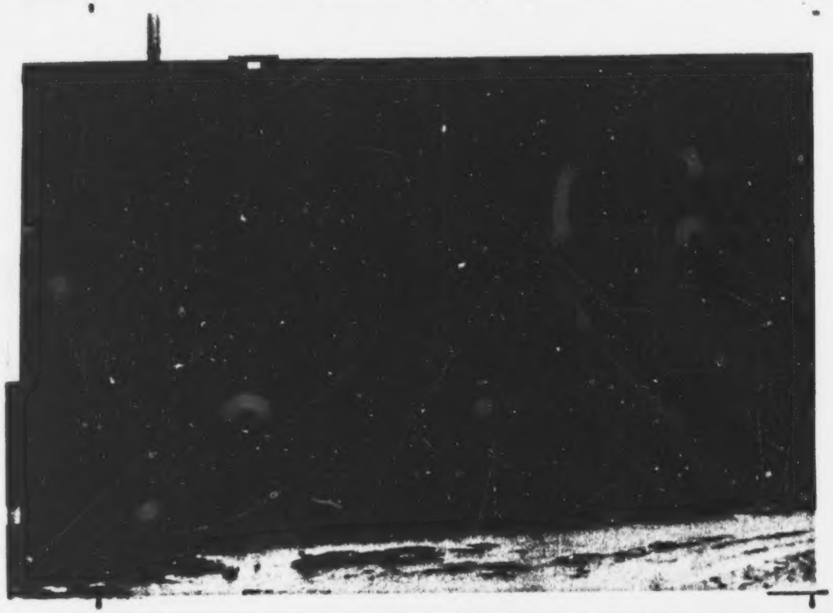
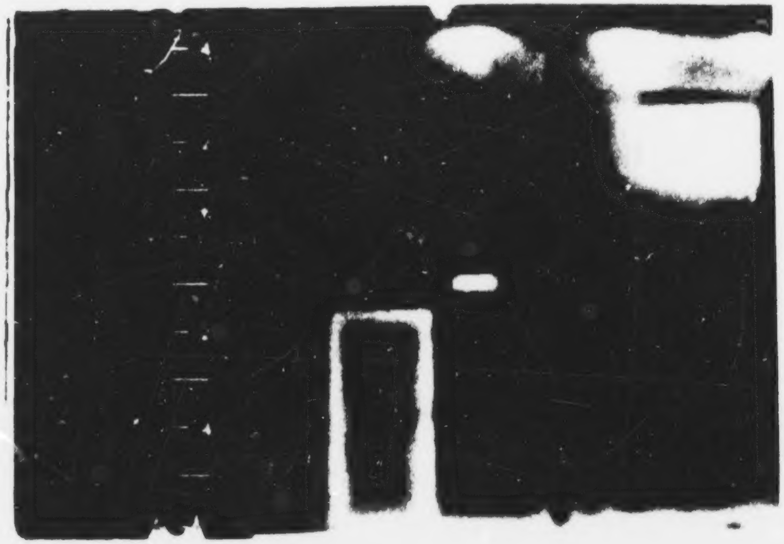


PHOTO.
NO.
1



LOCATION : HumboldtUniplex

DESCRIPTION : Community Center - East corner of north-east face.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

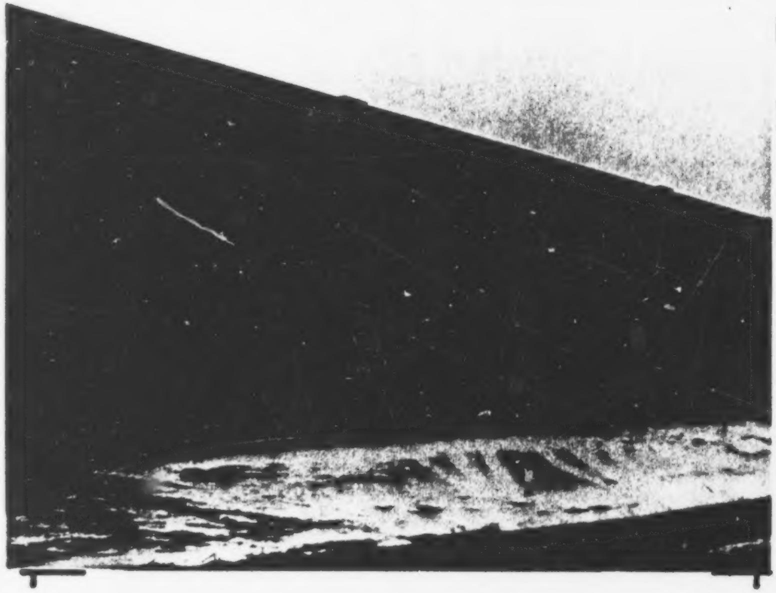
COMMENTS :

REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Air exfiltration at the roof line.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.



LOCATION :

Humboldt Uniplex

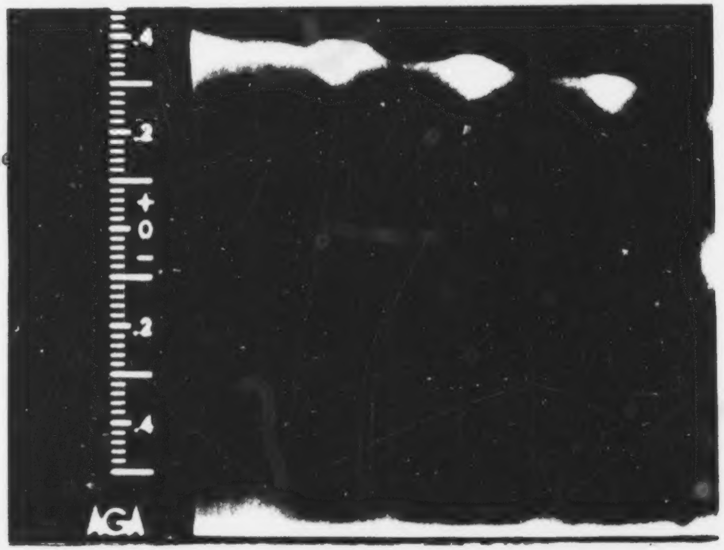
DESCRIPTION :

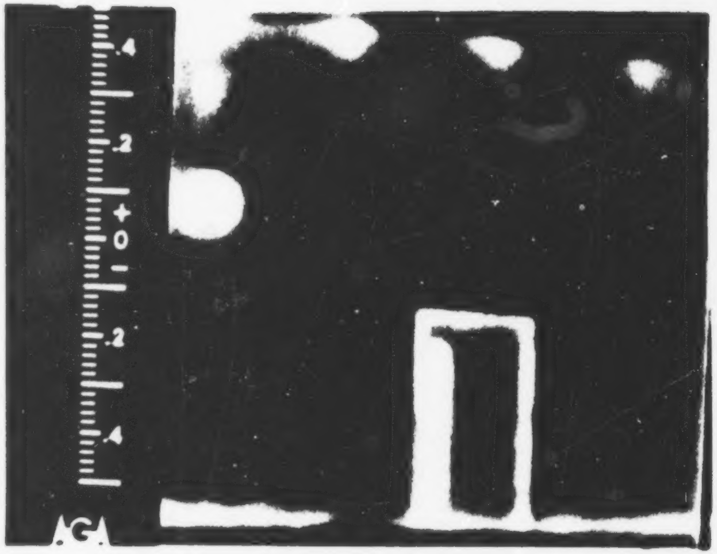
North-east face of the Community Center.

PROBLEM IDENTIFICATION :

INFILTRATION : X
INSULATION :
BRIDGING :
CONDENSATION :

PHOTO NO. 2





LOCATION :

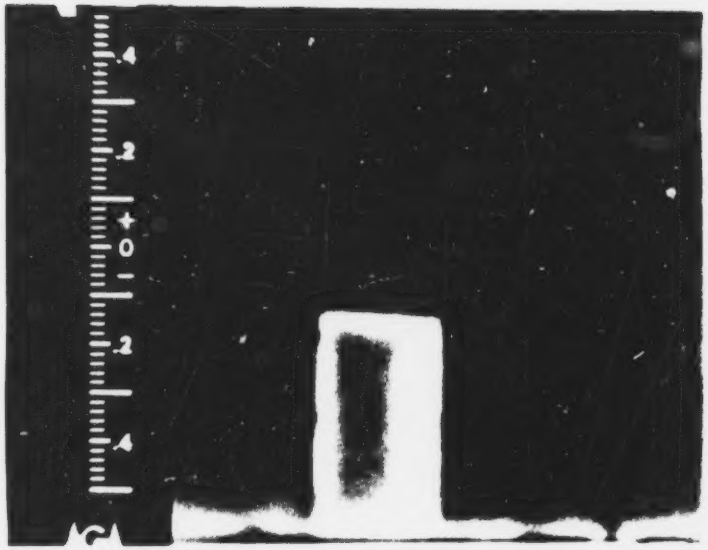
as above

DESCRIPTION :

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING
CONDENSATION

3 PHOTO NO. 4



heatscan by THERMAL FOCUS Inc.

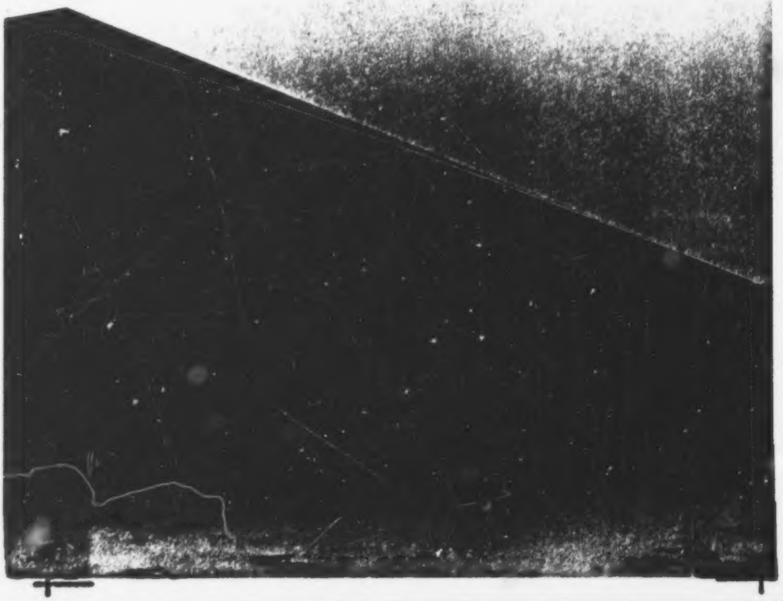
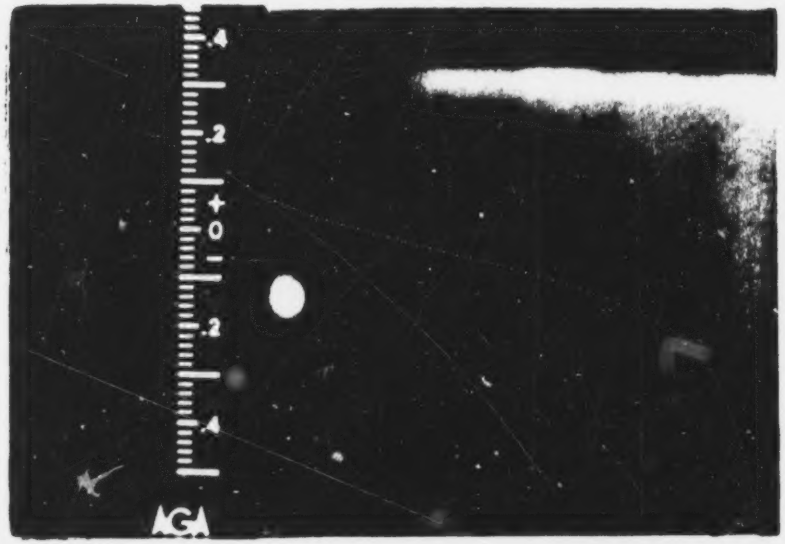


PHOTO.
NO.
5



LOCATION : Humboldt Uniplex

DESCRIPTION : West corner of the north-west face of the Community Center.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : No thermal anomalies evident.
Note: The colour photo is not at the same angle

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

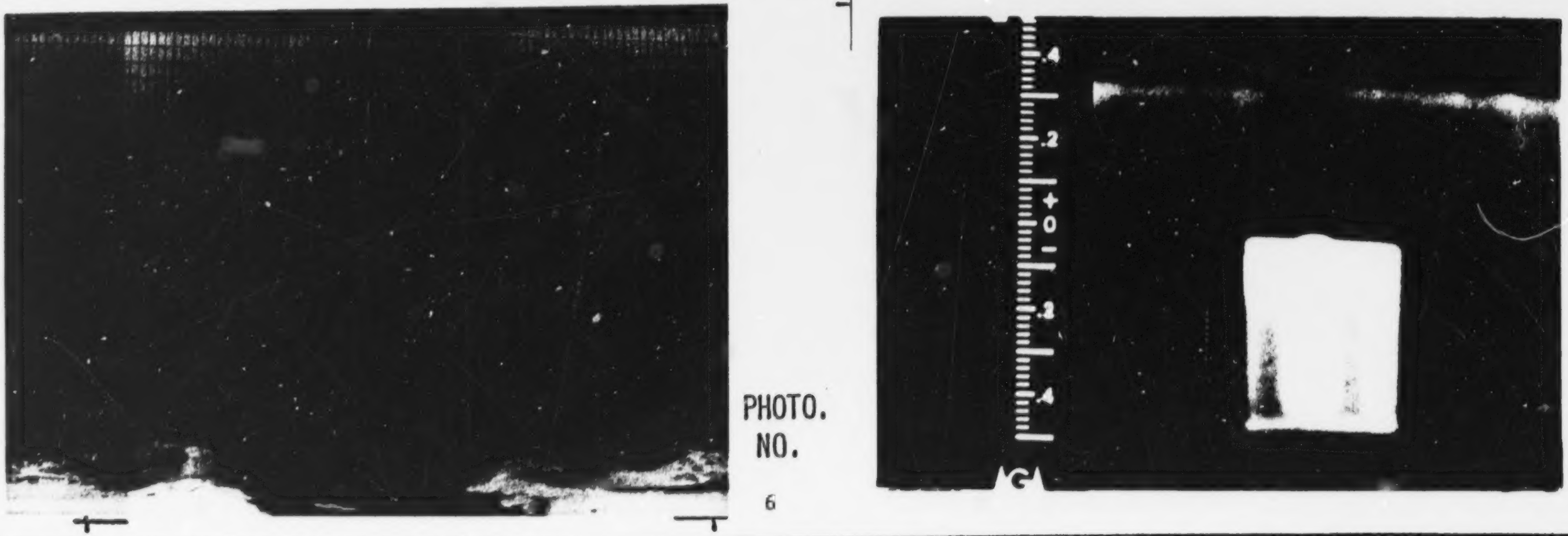


PHOTO. NO. 6

LOCATION : Humboldt Uniplex

DESCRIPTION : Center exit of the north-west wall of the Community Center

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

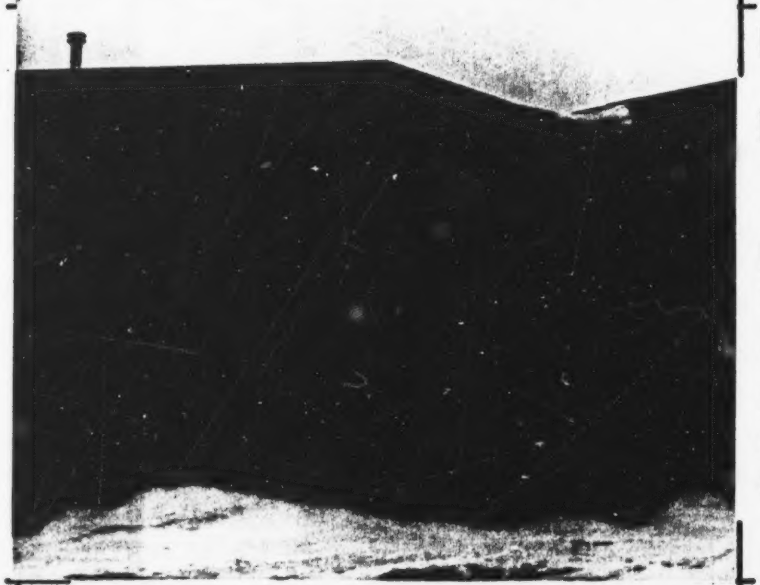
COMMENTS :

REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Moderate air exfiltration from the doors.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.



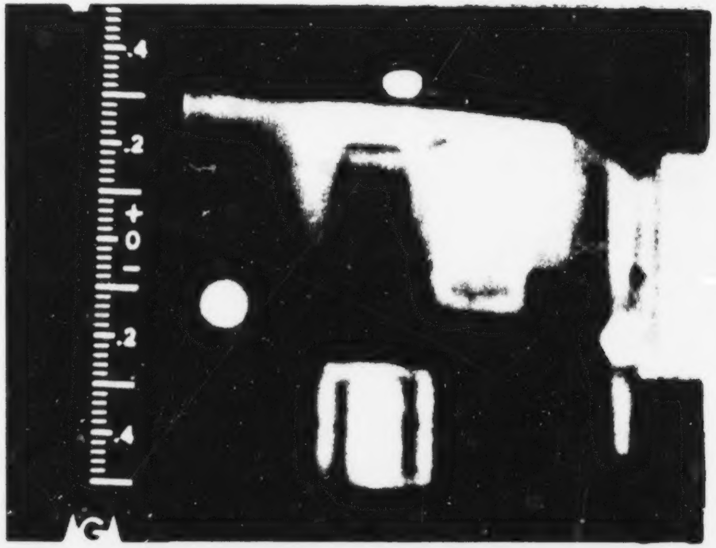
LOCATION :
Humboldt Uniplex

DESCRIPTION :
North-west corner of
Community Center

PROBLEM
IDENTIFICATION :

INFILTRATION : x
INSULATION :
BRIDGING :
CONDENSATION :

PHOTO NO. 7



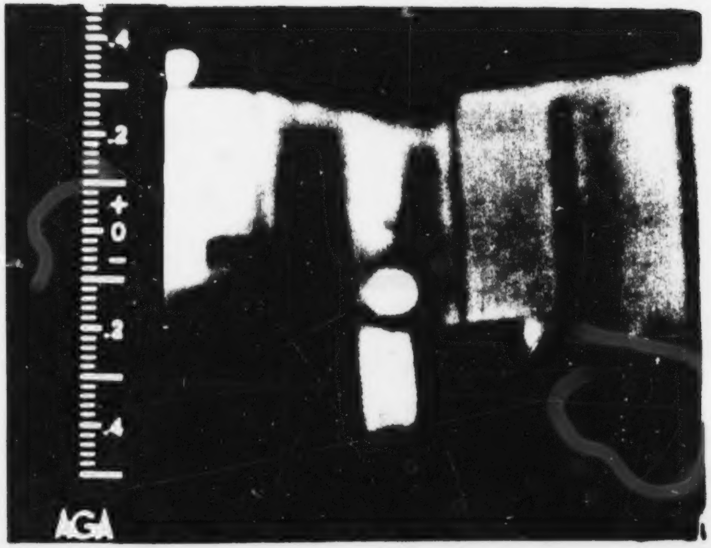
LOCATION :
as above

DESCRIPTION :

PROBLEM
IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING
CONDENSATION

PHOTO NO. 8



heatscan by THERMAL FOCUS Inc.

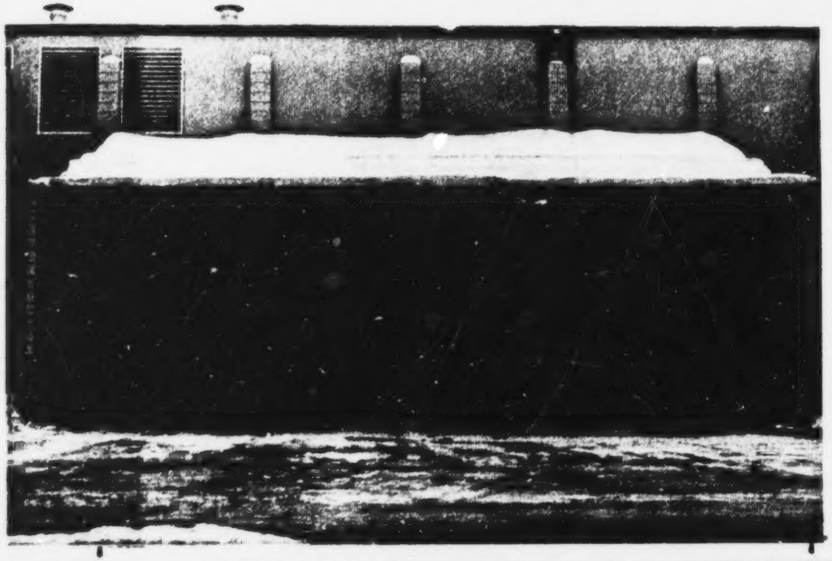
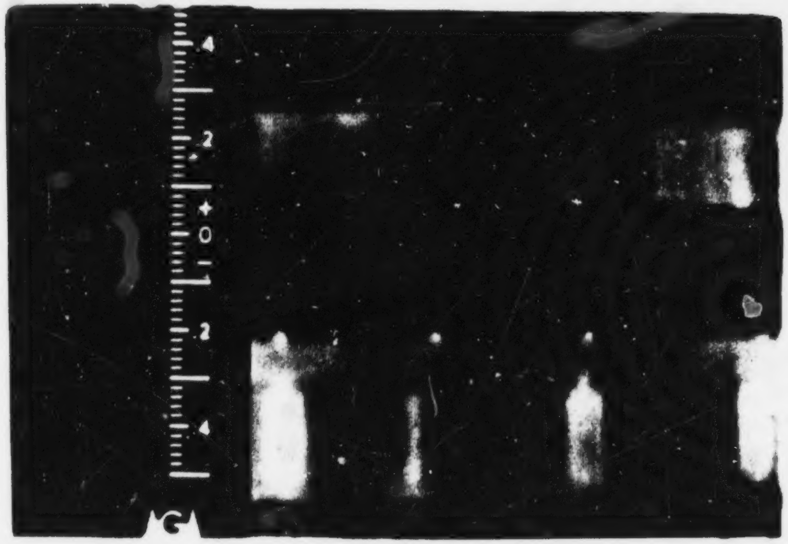


PHOTO.
NO.
9



LOCATION : Humboldt Uniplex

DESCRIPTION : North main doors to the Hockey Arena.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

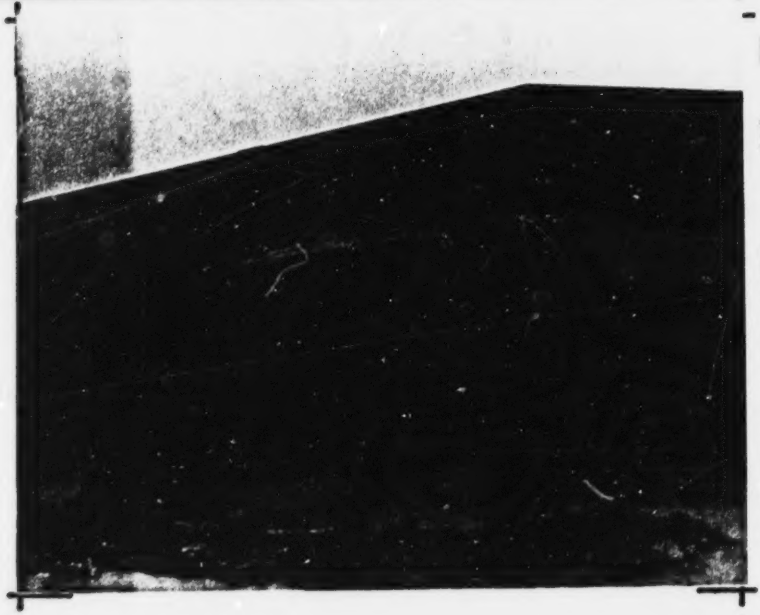
INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

COMMENTS :

REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Moderate heat loss through doors.

DATE :
CONTRACT NO:



LOCATION :

Humboldt Uniplex

DESCRIPTION :

North-west exit of the Hockey Arena.

PROBLEM IDENTIFICATION :

INFILTRATION : X
INSULATION :
BRIDGING : X
CONDENSATION :

PHOTO NO. 10

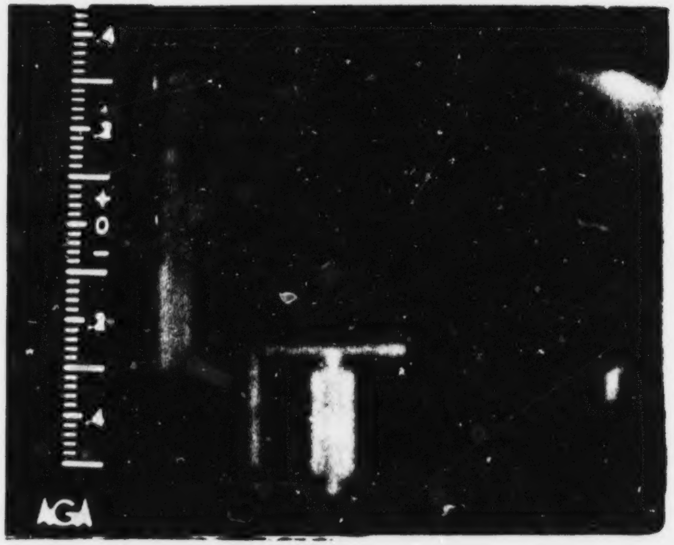


Photo not Available

LOCATION :

as above

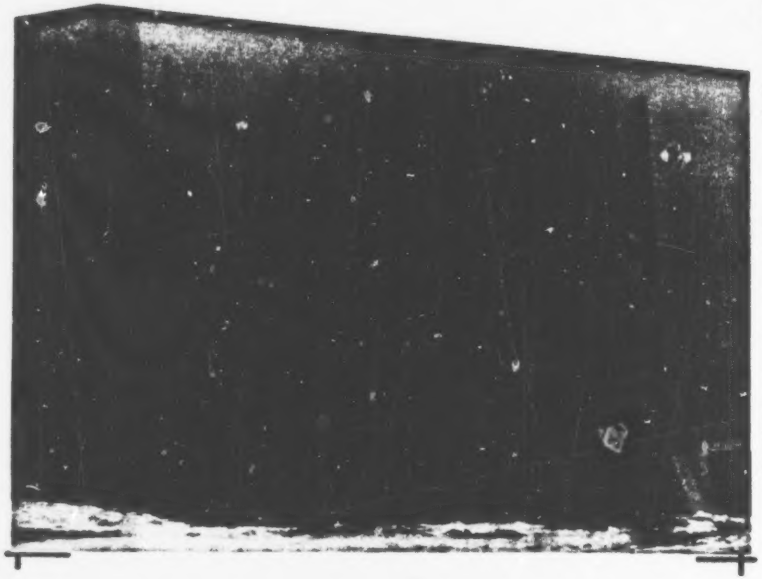
DESCRIPTION :

South-west exit of the Hockey Arena.

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING
CONDENSATION

PHOTO NO. 11

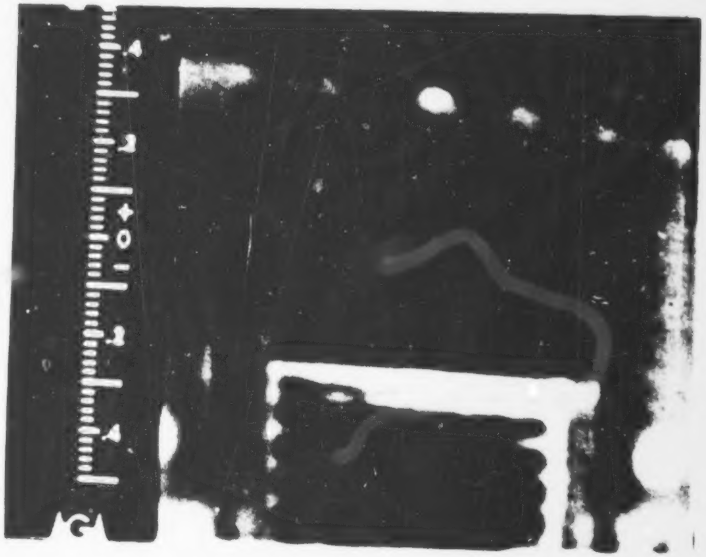


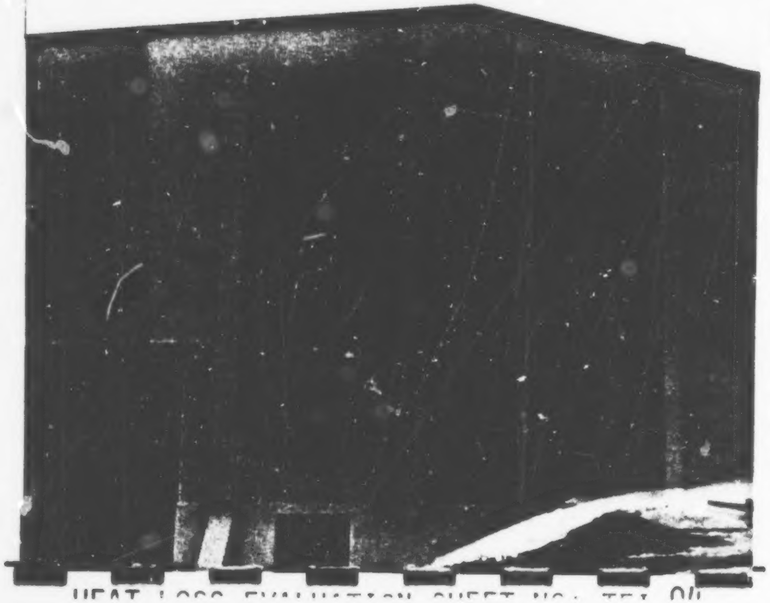
LOCATION :
Humboldt Uniplex
DESCRIPTION :
West wall of Hockey Arena.

PROBLEM IDENTIFICATION :

INFILTRATION : X
INSULATION :
BRIDGING :
CONDENSATION :

PHOTO NO. 12



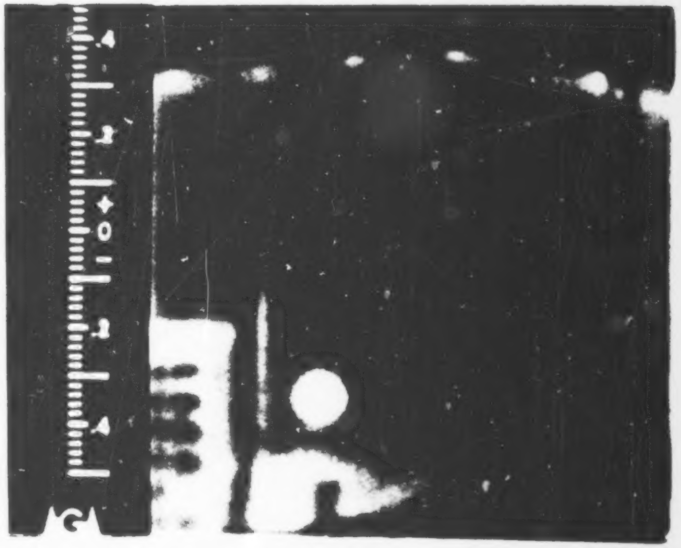


LOCATION :
as above
DESCRIPTION :

PROBLEM IDENTIFICATION :

INFILTRATION X
INSULATION
BRIDGING X
CONDENSATION

PHOTO NO. 13



heatscan by THERMAL FOCUS Inc.

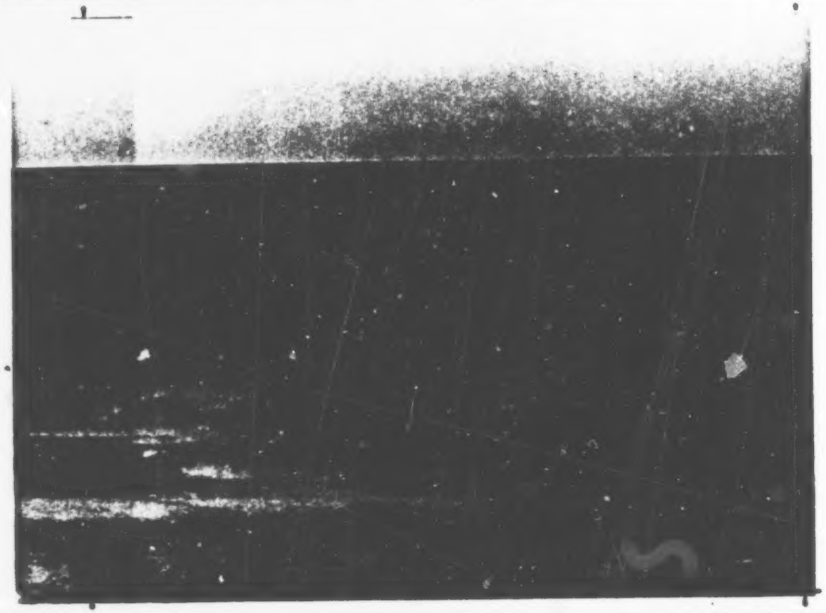
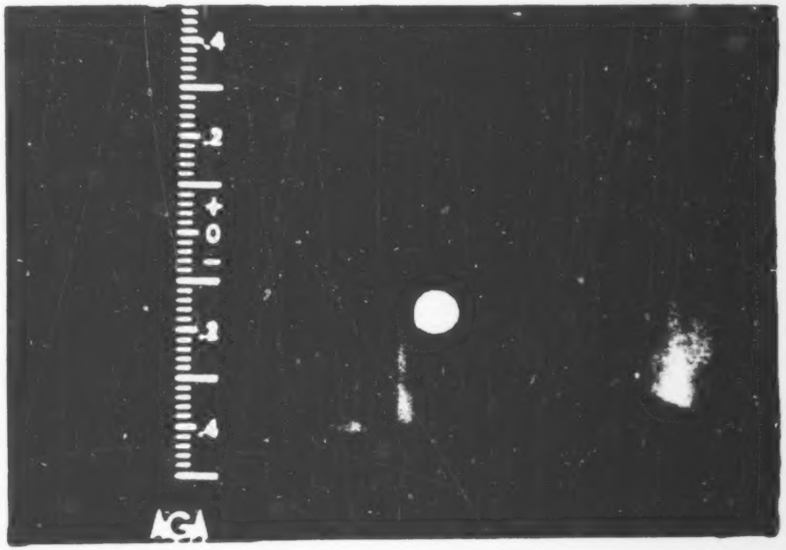


PHOTO.
NO.
14



LOCATION : Humboldt Uniplex

DESCRIPTION : South-west face of the Curling Rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION : x
INADEQUATE INSULATION :
THERMAL BRIDGING : x
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

COMMENTS :

REFER TO COMMENTS BELOW : x
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Thermal anomaly to the right of the door is not explained, though the discernable striation in the centre suggests some association with a possible wall-structure feature.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

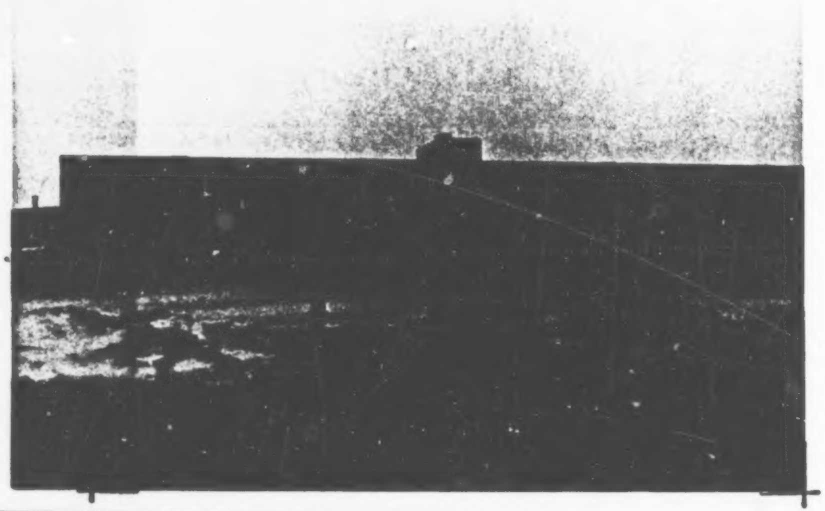


PHOTO.
NO.
15

LOCATION : Humboldt Uniplex

DESCRIPTION : South corner of the south-east face of the Curling Rink.

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

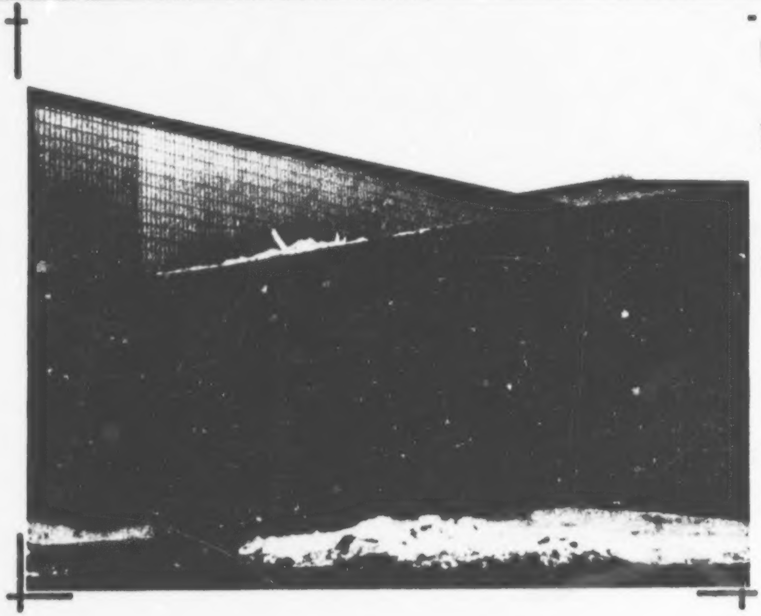
COMMENTS :

REFER TO COMMENTS BELOW : X
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Typical thermogram showing no thermal anomalies.

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.



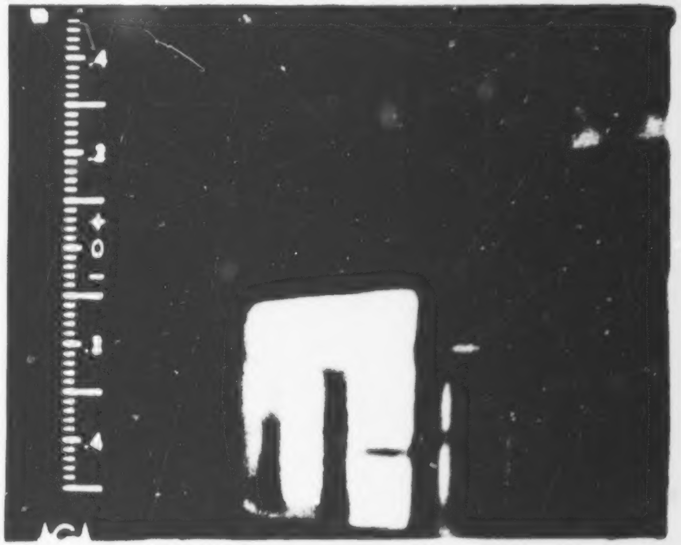
LOCATION :
Humboldt Uniplex

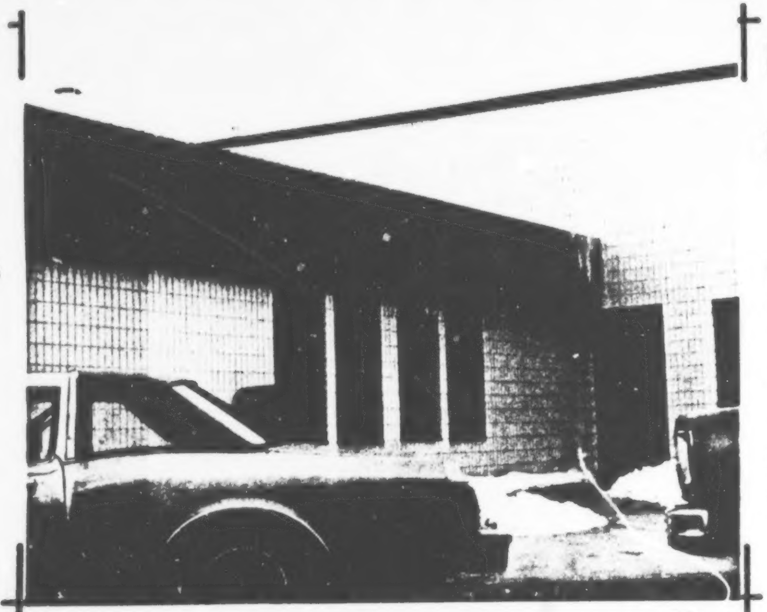
DESCRIPTION :
Curling Rink Entrance

PROBLEM IDENTIFICATION :

INFILTRATION : X
INSULATION :
BRIDGING : X
CONDENSATION :

PHOTO NO. 16





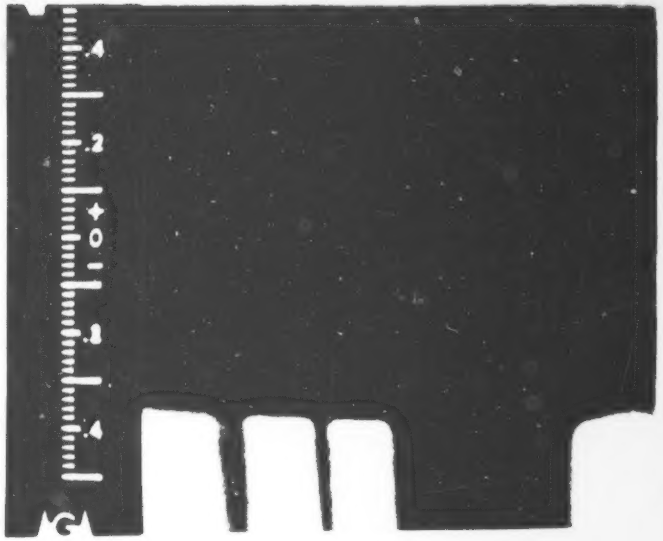
LOCATION :
Humboldt Uniplex

DESCRIPTION :
South-east wall of Community Center above Lobby.

PROBLEM IDENTIFICATION :

INFILTRATION
INSULATION
BRIDGING X
CONDENSATION

x PHOTO NO. 17



heatscan by THERMAL FOCUS Inc.

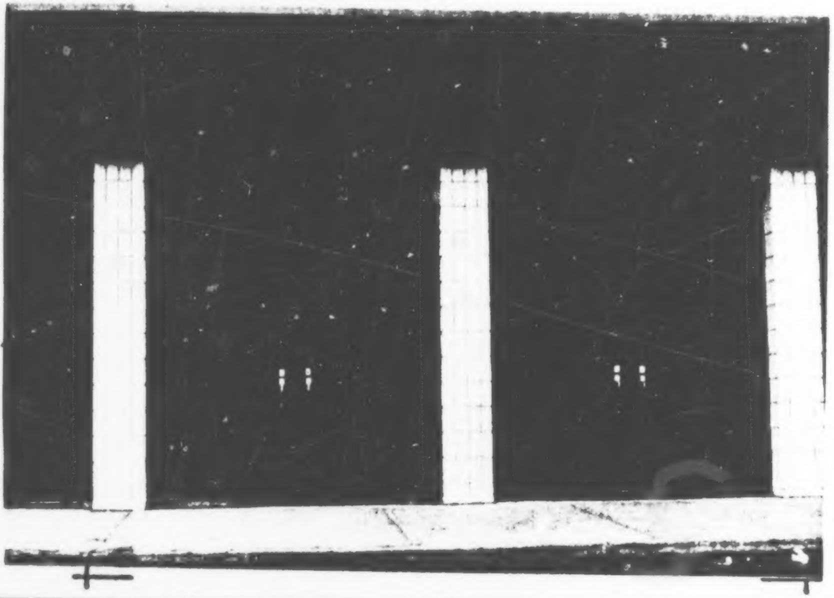
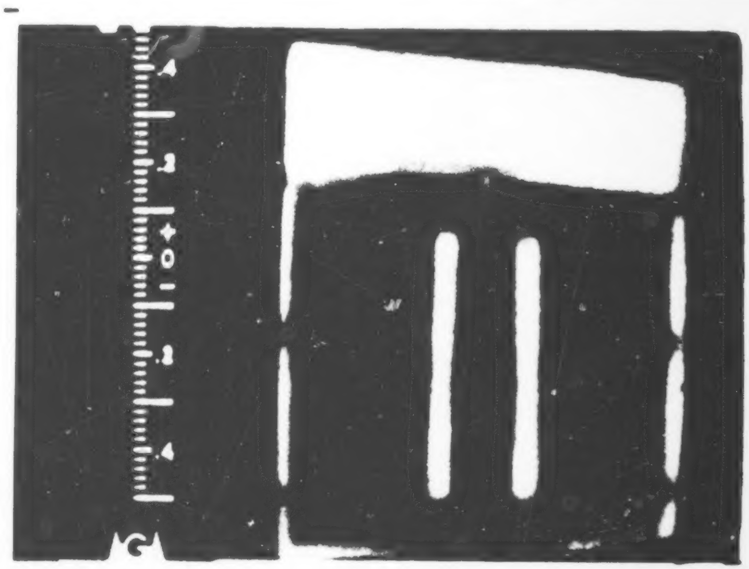


PHOTO. NO. 18



LOCATION : Humboldt Uniplex

DESCRIPTION : Lobby Main Doors

PROBLEM IDENTIFICATION :

AIR INFILTRATION : x
INADEQUATE INSULATION :
THERMAL BRIDGING : x
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS :

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

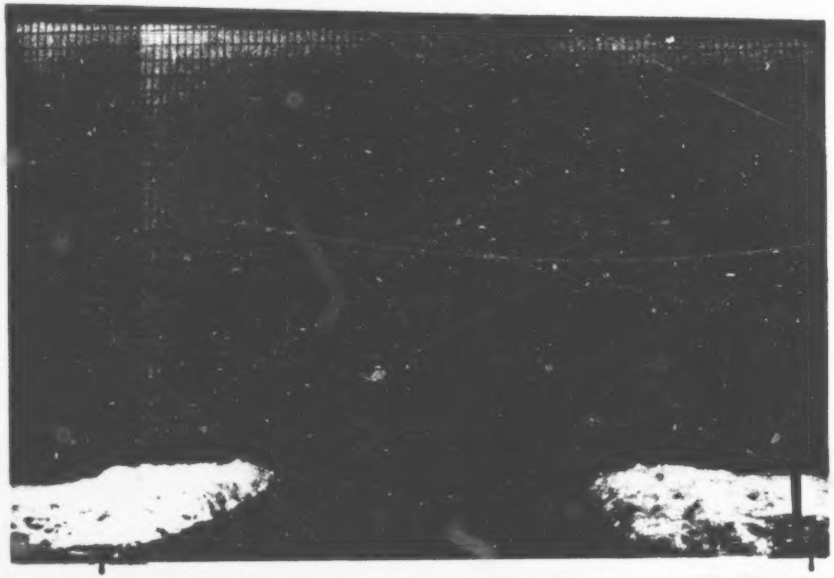
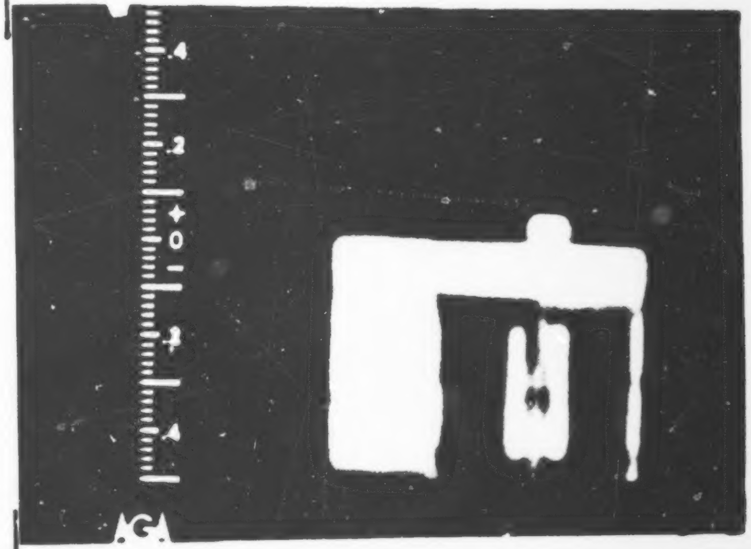


PHOTO.
NO.
19



LOCATION : Humboldt Uniplex

DESCRIPTION : Community Center Entrance

PROBLEM IDENTIFICATION :

AIR INFILTRATION : X
INADEQUATE INSULATION :
THERMAL BRIDGING : X
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS :

DATE :
CONTRACT NO:

heatscan by THERMAL FOCUS Inc.

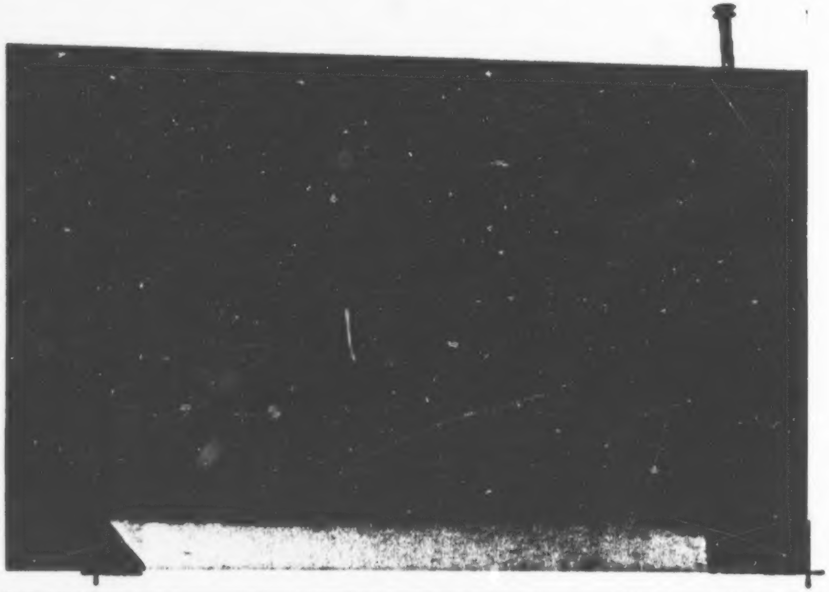
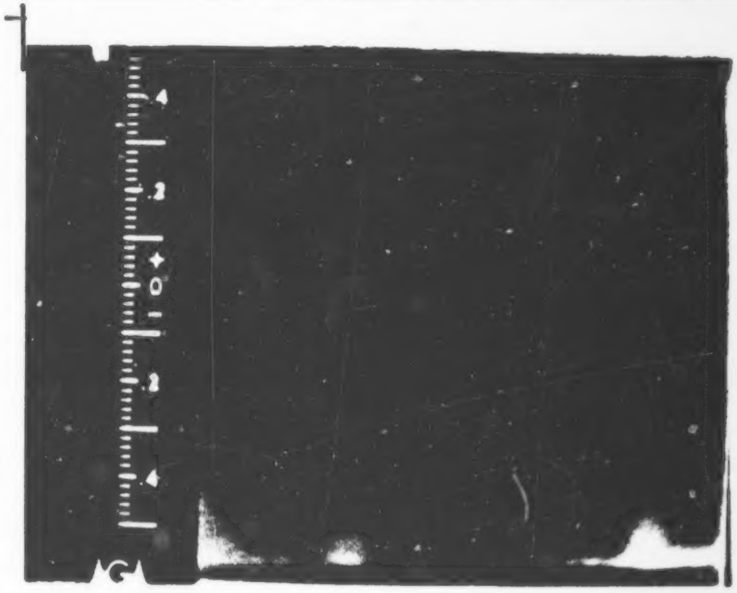


PHOTO. NO. 20



LOCATION : Humboldt Uniplex

DESCRIPTION : South-east face of the Community Center

PROBLEM IDENTIFICATION :

AIR INFILTRATION :
INADEQUATE INSULATION :
THERMAL BRIDGING :
CONDENSATION :

DATA :

INTERIOR AIR TEMPERATURE : C.
EXTERIOR AIR TEMPERATURE : -4° C.

COMMENTS :

REFER TO COMMENTS BELOW :
REFER TO SUMMARY OF FINDINGS :

SPECIAL COMMENTS : Thermal anomaly extending from the base up the wall to the roof. This appears to be due to air exfiltration at the base.

DATE :
CONTRACT NO:

2.0 Thermography

The technique of measuring the amount of invisible infrared radiation (invisible heat) is called thermography. We accomplish this by using a highly specialized camera that converts the infrared radiation into a visible television like picture. The picture is then photographed, giving us a permanent record of the object under investigation. This photograph is called a thermogram.

Thermograms, in conjunction with additional data collected on site are used to evaluate the condition of the roof under study.

The AGA 782 Thermovision system used by Thermal Focus Incorporated can measure temperatures from -20 C to +2000 C. It also detects and displays temperature differences as small as 0.1 C.

How to read a Thermogram

The black and white pictures in your report are the thermograms that indicate the various temperature levels of the roof.

The thermograms are in various shades of grey, representing different temperature levels. On the thermograms black represents a cold area, whilst the white represents the warm areas. In the roofing survey, the areas of the roof that have moisture in the insulation will show up as the light or white parts. This is due to the fact that the roof was allowed to soak under sun conditions prior to the survey, allowing the moisture to absorb heat from the sun. The survey was then conducted in the early evening after the roof surface was given a chance to cool to or below the ambient temperature. As the moisture in the insulation retains its heat for a longer period of time relative to the surface temperature of the roof, one can then determine the areas of damage from the thermogram.

Thermographic Terminology

Isotherm:	A means of enhancing areas of similar surface temperature. The isotherm function shows up on the thermogram as a series of white dots.
Dual Isotherm:	Two isotherm functions displayed simultaneously.

Air Infiltration:	The unintended free movement of outside air to the inside of the structure.
Air Exfiltration:	The unintended free movement of inside air to the outside environment.
Thermal Bridging:	The result of the use in construction of materials that give rise to local heat transfer rates different from the average rate; as in the care of wall studs.

3.0 General Comments

1. The thermographic inspection was performed on March 23, 1983 from 10:00 p.m. to 12:00 p.m. to minimize residual solar effects. The temperature was -4°C with overcast skies and south-east wind of 9 Km/hr.

2. A full external peripheral infrared survey was performed. Sites of abnormal and typical thermal anomalies were recorded as hard copy 35 mm photographs and are presented in this report with the corresponding colour photograph at the same location. These locations and a full external thermographic scan were recorded on tape for subsequent review, discussion or demonstration.

3. The intensity of a thermal anomaly in one thermogram cannot be compared to the intensity in another thermogram. The relative heat loss of an area can only be compared to the heat loss af an area in the same thermogram.

4.0 Specific Comments

4.1 Exterior Walls

1. The exterior walls show regular sites of air exfiltration at the juncture of the wall and roof. This problem is prevalent in the community center north-east wall.
   Thermogram 1, 2, 3.

2. The roof line shows some areas of thermal bridging. This thermal anomaly is not very intense and is expected at some corners.
   Thermogram 4, 5.

3. The north-west corner of the community center shows a large thermal anomaly in the upper corner. This appears to be due to the warmer mechanical room and does not necessarily indicate a problem.
   Thermogram 7, 8.

4. The small west exit structure on the north and south wall of the hockey arena show a thermal anomaly due to the corner affect. This is of moderate intensity, slightly greater than expected.
   Thermogram 10, 11.

5. The community center and the curling rink wall above the lobby show vertical thermal anomalies, usually associated with thermal bridging.
   Thermogram 16, 17.

6. The south-east face of the Community Center shows vertical anomalies extending from the base up the wall. This may be due to exfiltrating air at the base, or to the mechanical equipment inside the building.
   Thermogram 20

7. The thermogram of the west wall shows thermal bridging of the conconcrete foundation below ground level.
   Thermogram 12,13

4.2 Exits

1. The exits of the Uniplex show heat loss due to thermal bridging and air exfiltration. This heat loss is expected, but is not abnormally high.

2. The large overhead door to the arena shows heat loss along the top and right side. This appears to be due to air exfiltration.
   Thermogram 12, 13

5.0 Conclusions

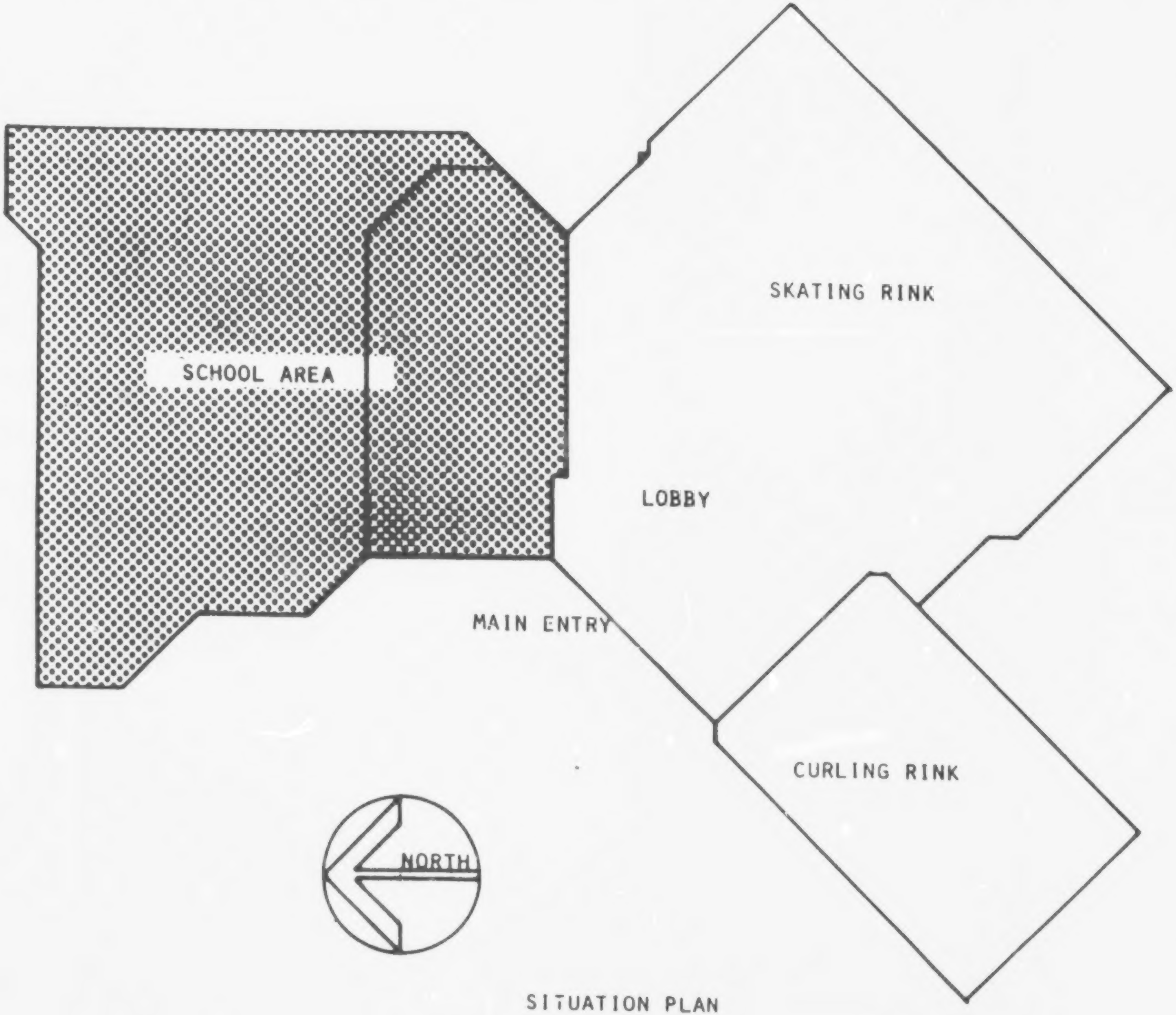
The Humboldt Uniplex exhibits thermal faults associated with the constuction of the building. These faults are not significant in terms of the overall performance of the building. The heat loss will not be substantially greater than predicted by design.

6.0 References

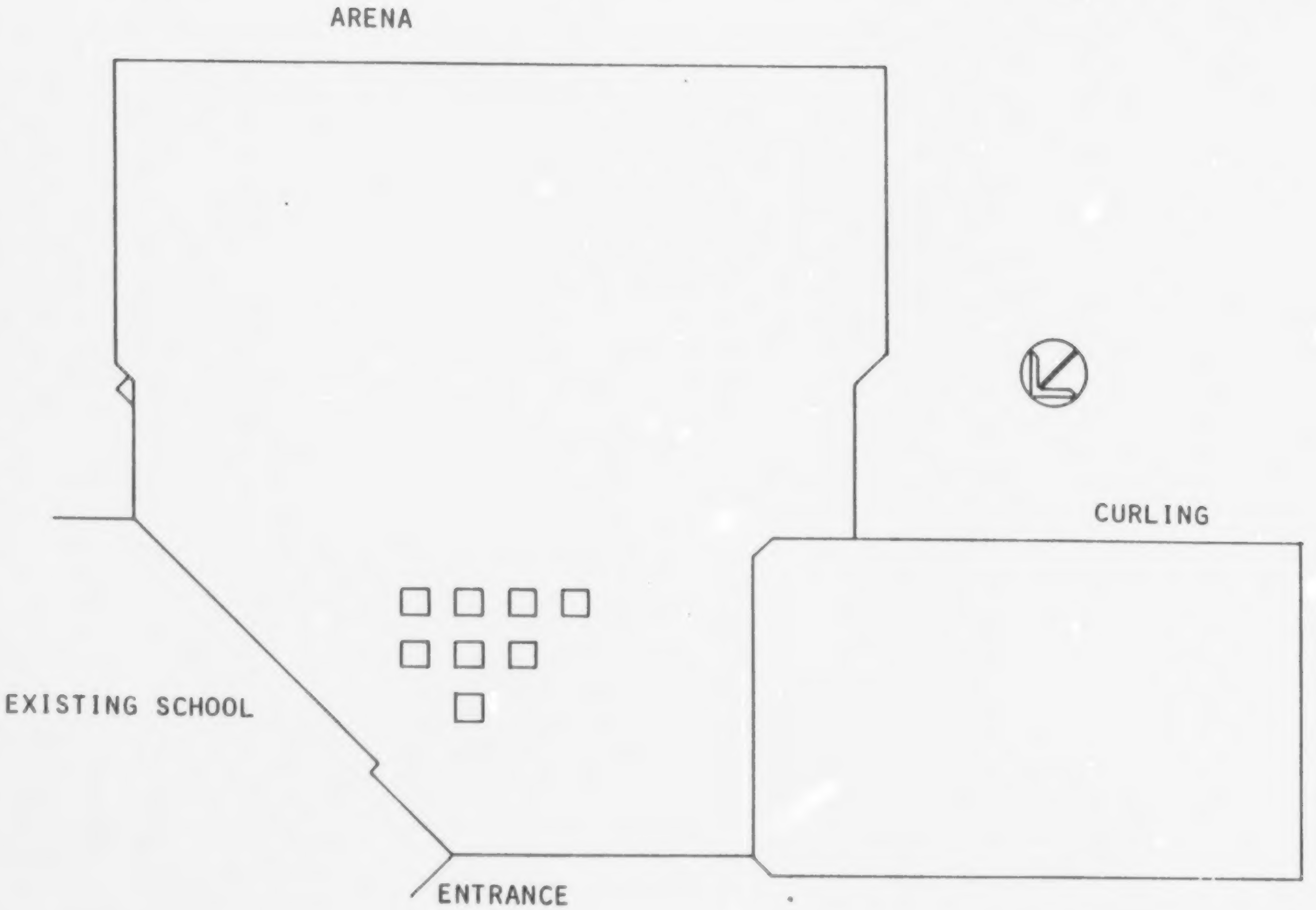
- Ivor Paljak, Bertil Pettersson. Thermography of Buildings; Svensk by Byggtjarst, Box 1403, S - 11184 Stockholm, Sweden. 1972.
- Brown G, Pettersson B. Detcecting and Analyzing Building Insulation Defects by the Thermographic Method. Swedish National Authority for Testing, Inspection and Meteorology. P.O. Box 5608, S-11486, Stockholm, Sweden. 1976.
- Chown, G.A., Kittson, J., Micelli. F., and Mill, P.A.D. Thermographic Investigation - Fathers of Confederation Centre for the Arts, Charlottetown, P.E.I. Public Works Canada 1978.
- Eklund, J. Energy Conservation in Buildings. AGA Corporation Secausus, New Jersey. Excerpt from IRIE, 1974.
- Grot, R.A., Haraje, D.T., and Johnston, R.C. Applications of Thermography for Evaluating Effectiveness of Retrofit Measures. Excerpt from IRIE 1976.
- Holmsten, D. Energy Conservation. Thermography of Buildings for Quality Inspection. Engineering Digest, Vol. 23 No. 1. January 1977.
- Pontello, A.P. Energy and Thermography. Partners for Tomorrow. Federal Energy Administration. Excerpt from IRIE 1976.
- Kulacki, F.A., Mintzer, O.W., Winget, L.E. Remote Sensing of Building Heat Loss - A Case Study for Development of Methodology. SPIE Thermosense IV, 1981.

APPENDIX "F"

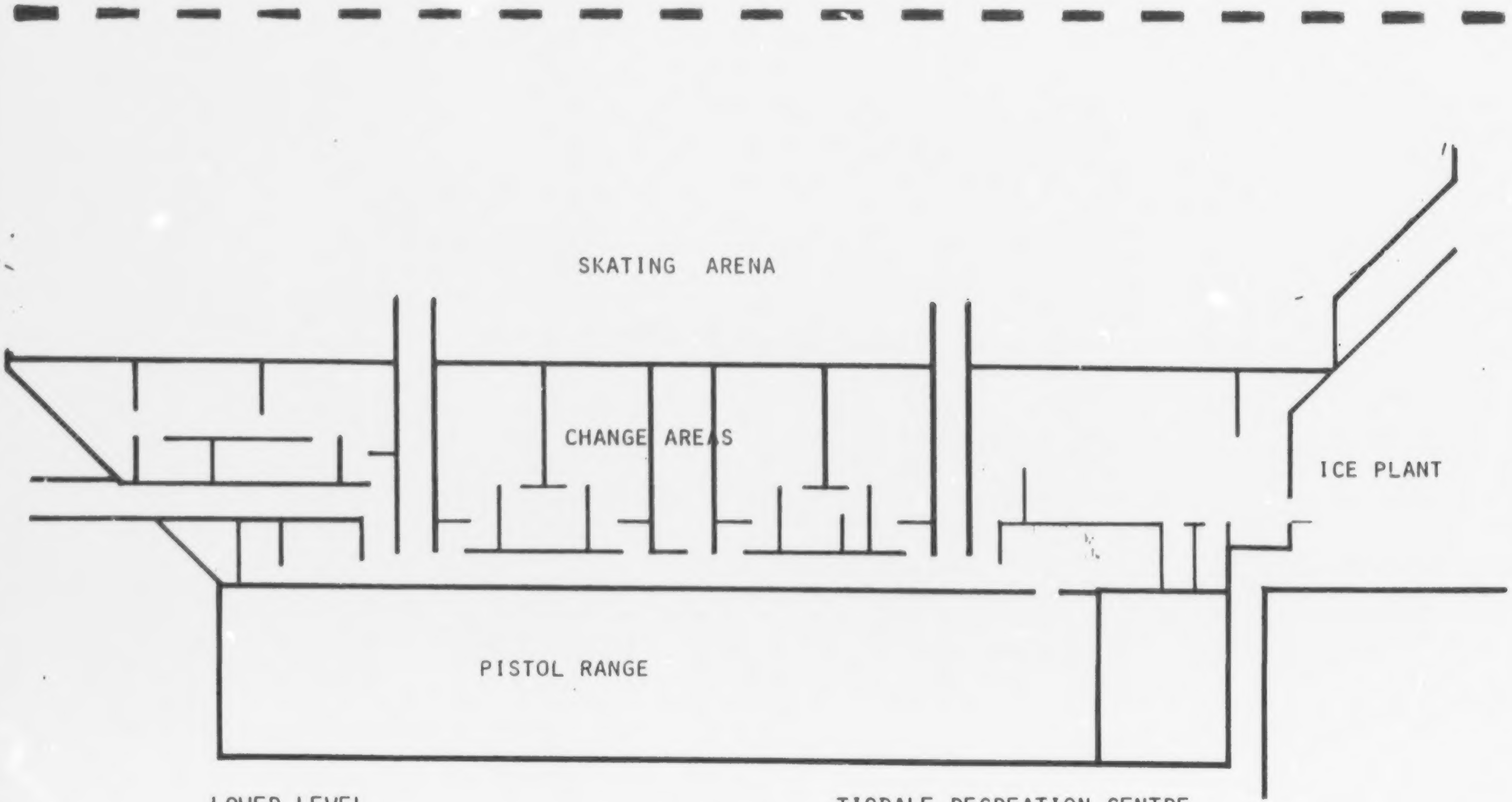
Floorplans ,elevations, section Tisdale Complex
Floorplans Humboldt Uniplex


SKATING RINK
SCHOOL AREA
LOBBY
MAIN ENTRY
CURLING RINK
NORTH

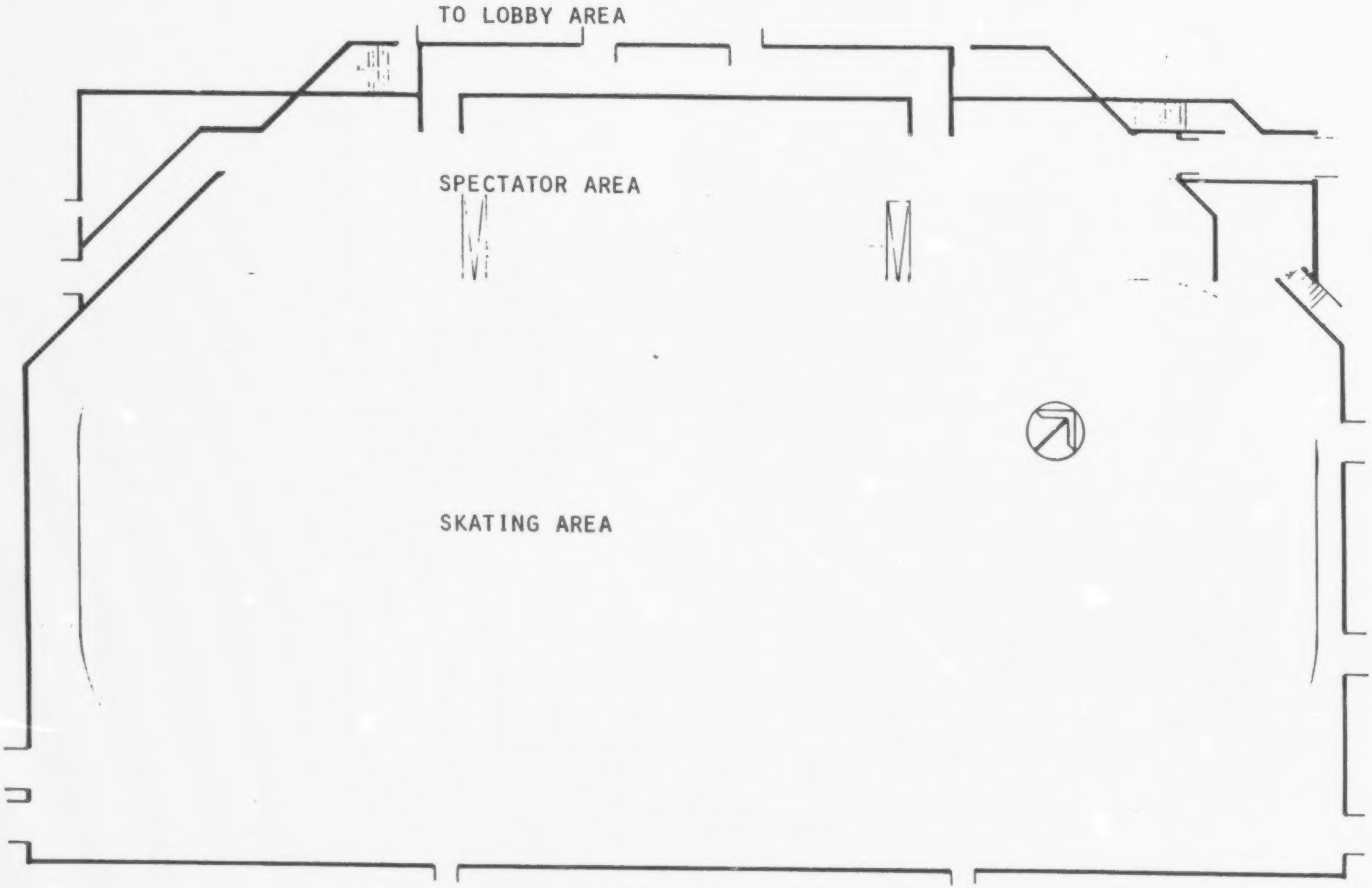
SITUATION PLAN


ARENA
CURLING
EXISTING SCHOOL
ENTRANCE

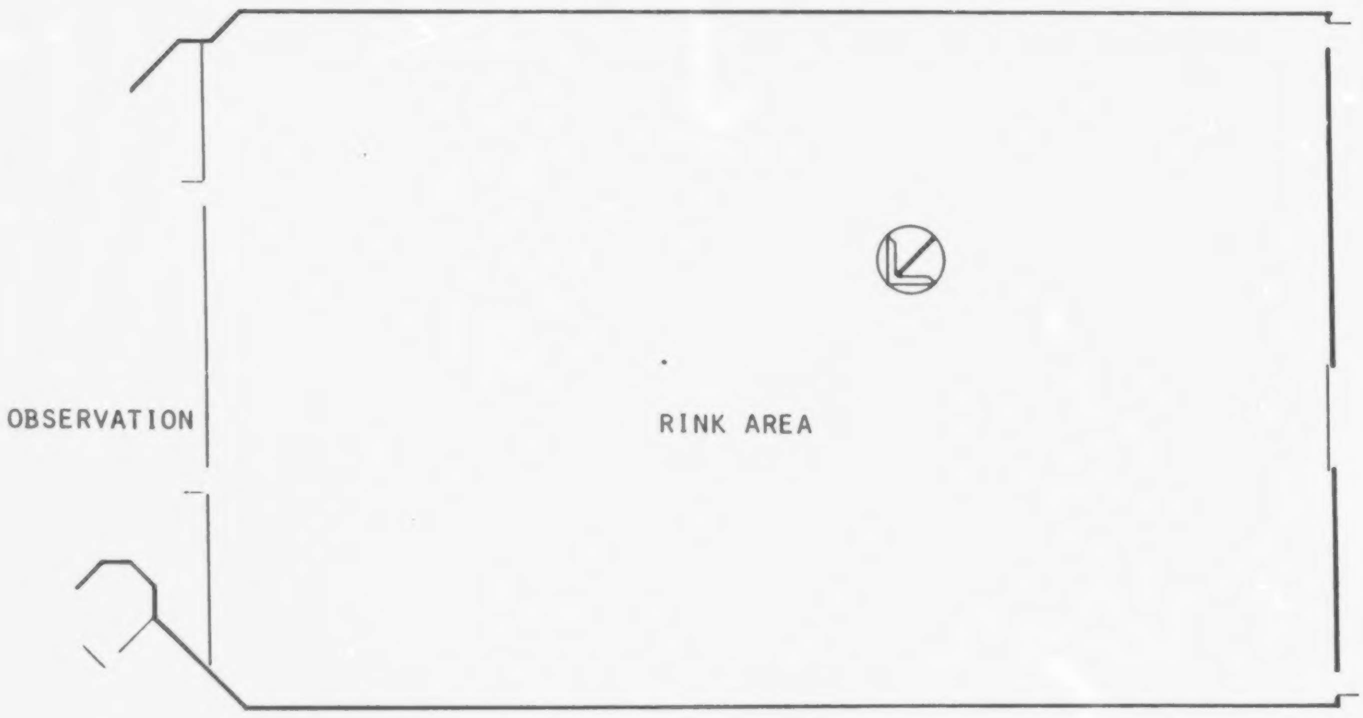
ROOF PLAN TISDALE RECREATION CENTRE


SKATING ARENA
CHANGE AREAS
ICE PLANT
PISTOL RANGE

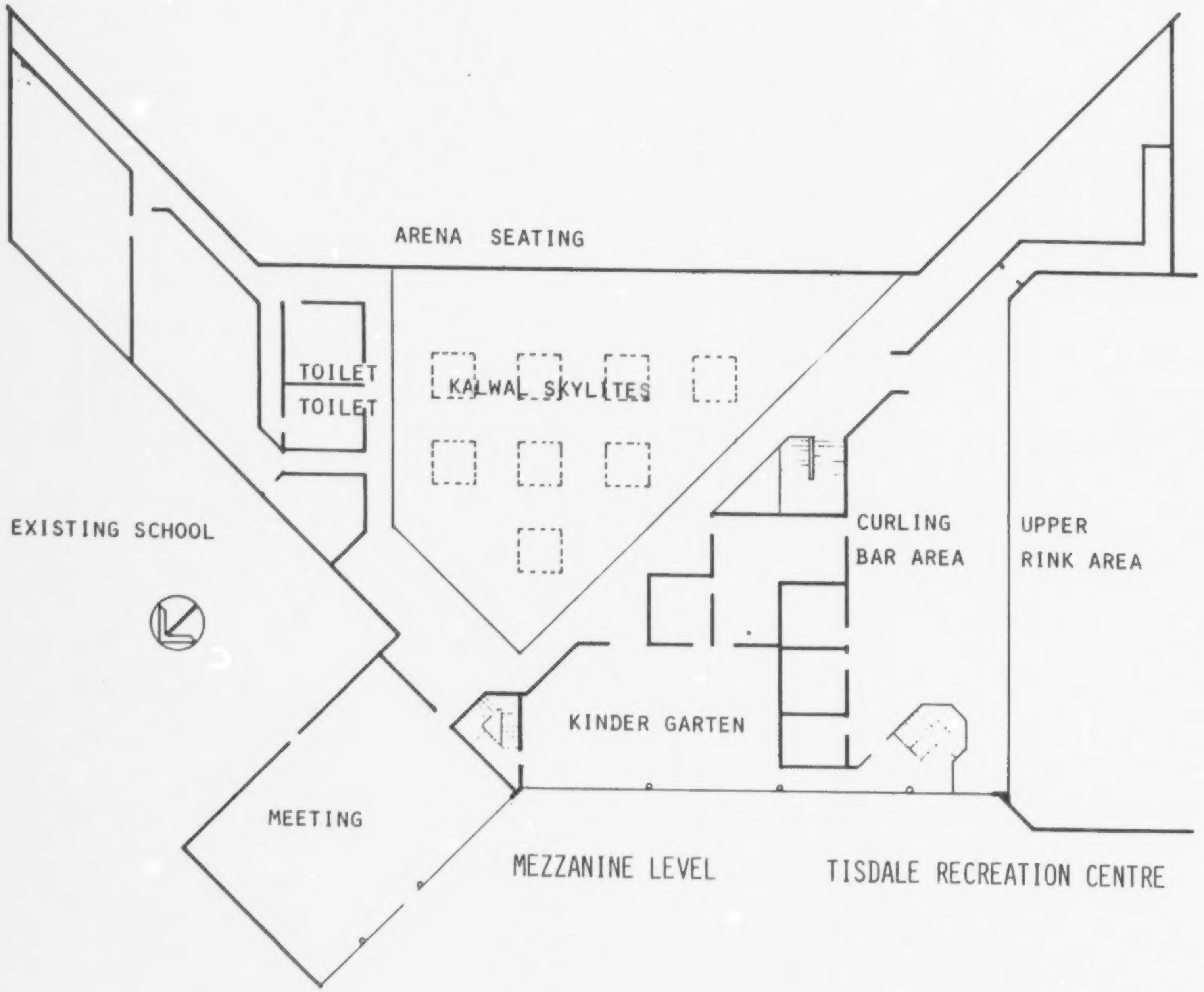
LOWER LEVEL TISDALE RECREATION CENTRE


TO LOBBY AREA
SPECTATOR AREA
SKATING AREA

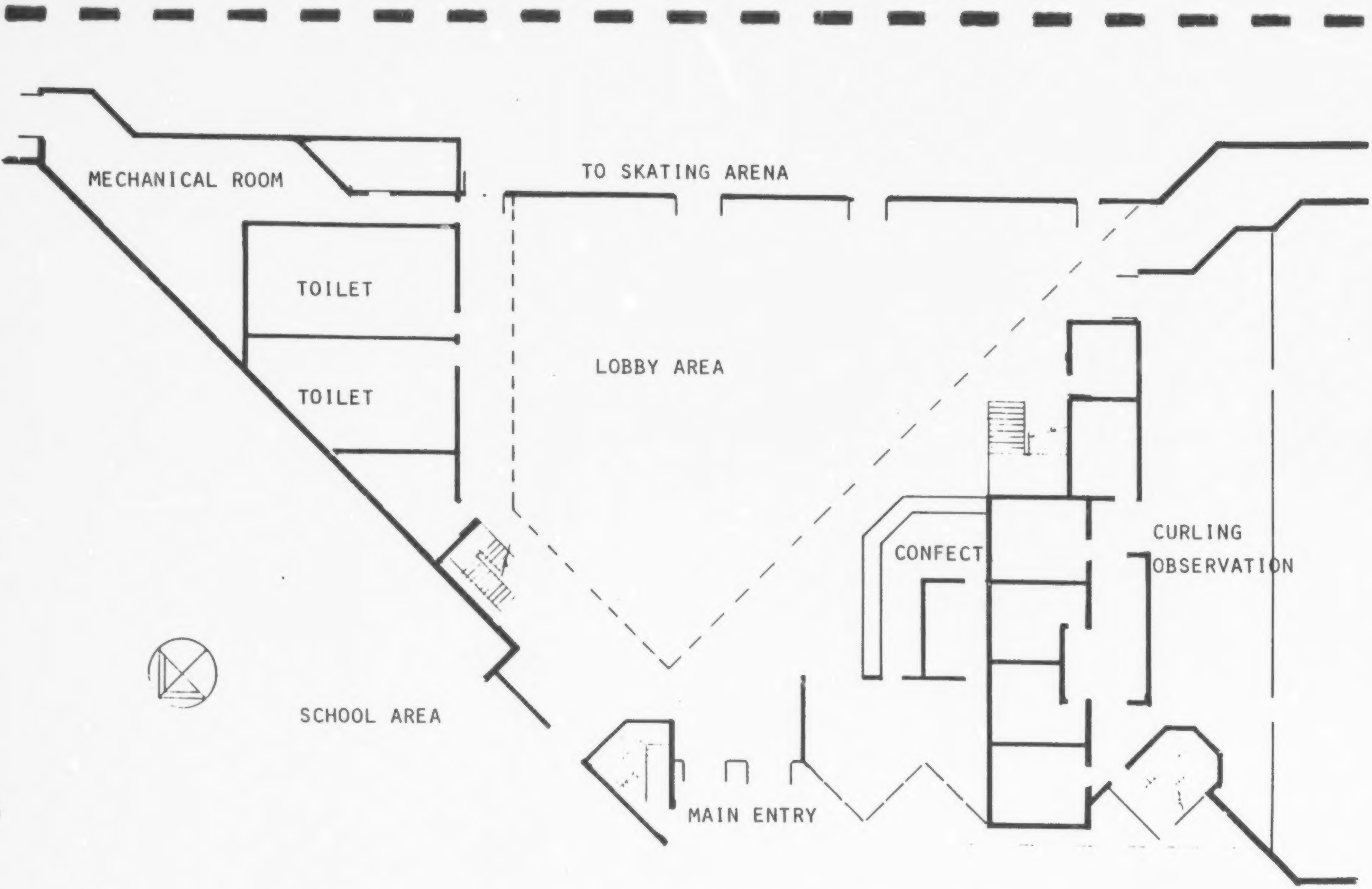
ARENA TISDALE RECREATION CENTRE


OBSERVATION
RINK AREA

CURLING RINK TISDALE RECREATION CENTRE

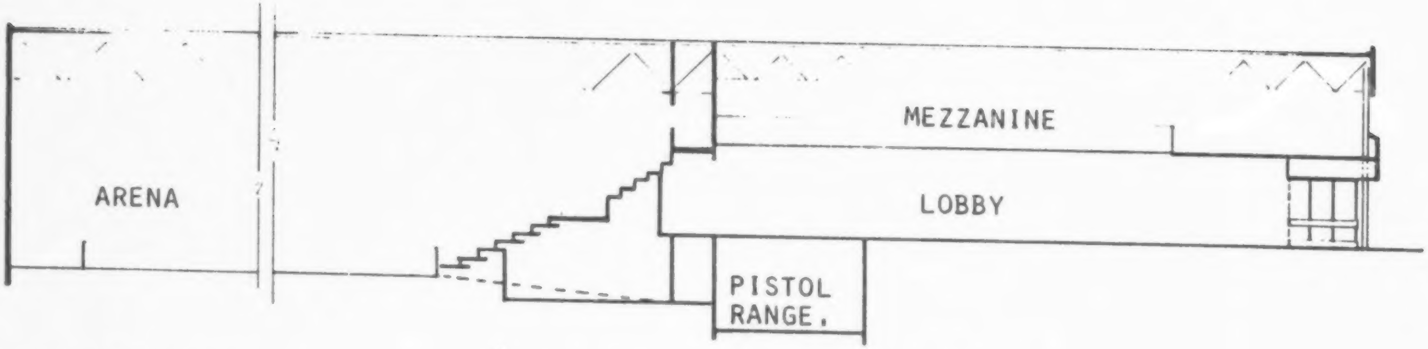

ARENA SEATING
TOILET
TOILET
KALWAL SKYLITES
EXISTING SCHOOL
CURLING
BAR AREA
UPPER
RINK AREA
KINDER GARTEN
MEETING

MEZZANINE LEVEL TISDALE RECREATION CENTRE


MECHANICAL ROOM
TO SKATING ARENA
TOILET
TOILET
LOBBY AREA
CURLING OBSERVATION
CONFECT
SCHOOL AREA
MAIN ENTRY

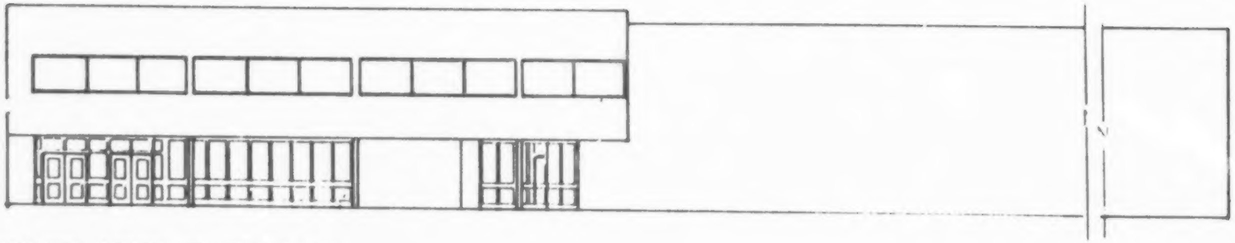
MAIN FLOOR

TISDALE RECREATION CENTRE

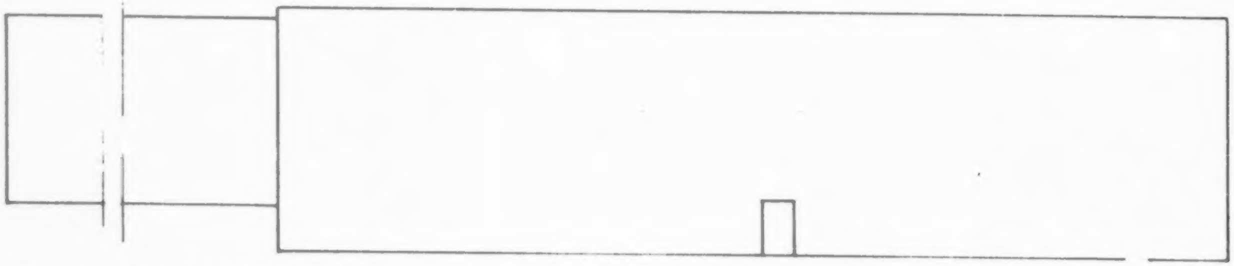

MEZZANINE
ARENA
LOBBY
PISTOL
RANGE.

BUILDING SECTION

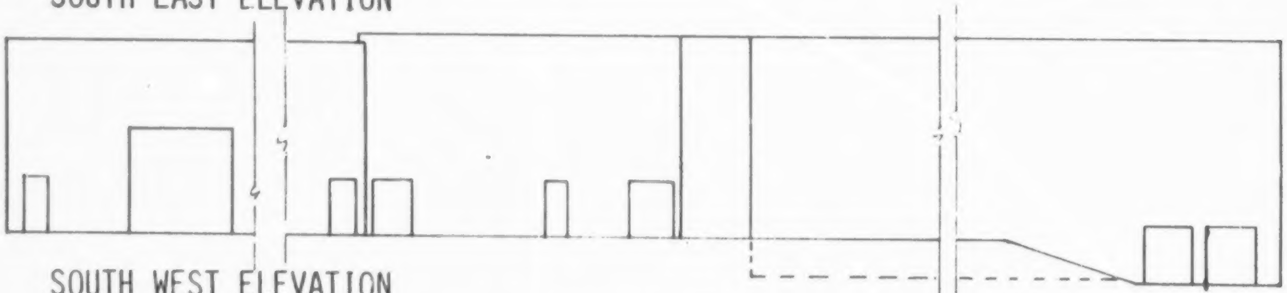
TISDALE RECREATION CENTRE



NORTH·WEST ELEVATION

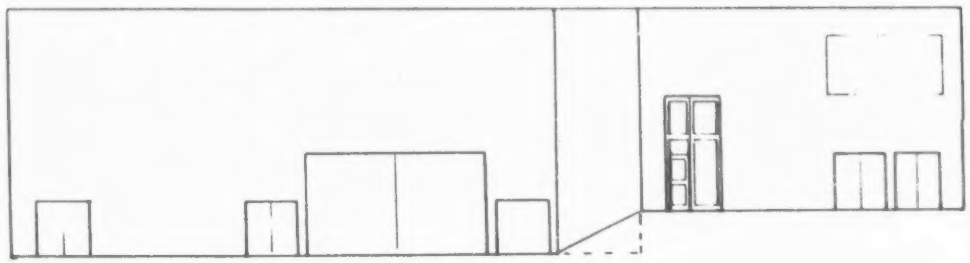


SOUTH EAST ELEVATION

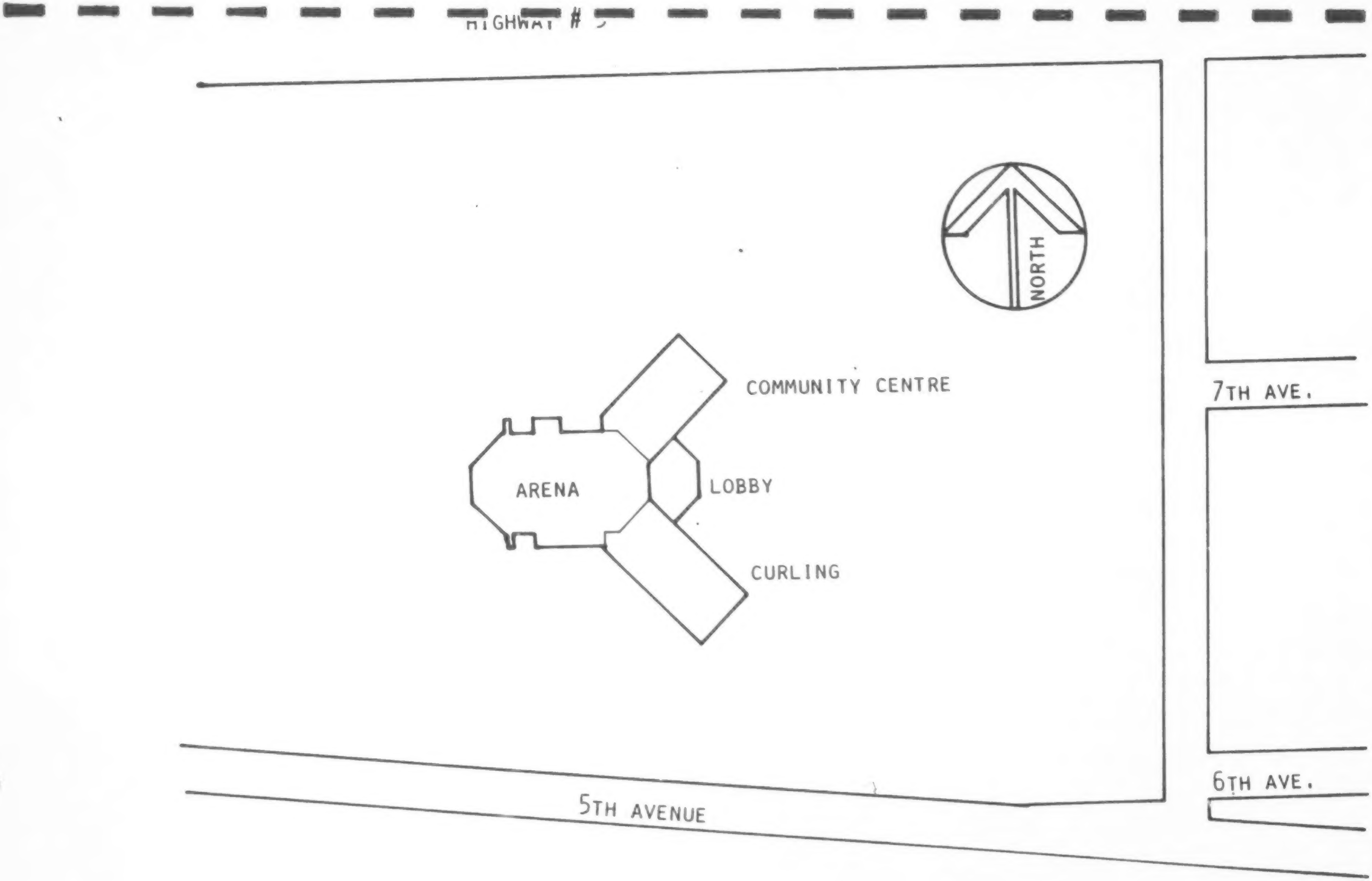


SOUTH WEST ELEVATION

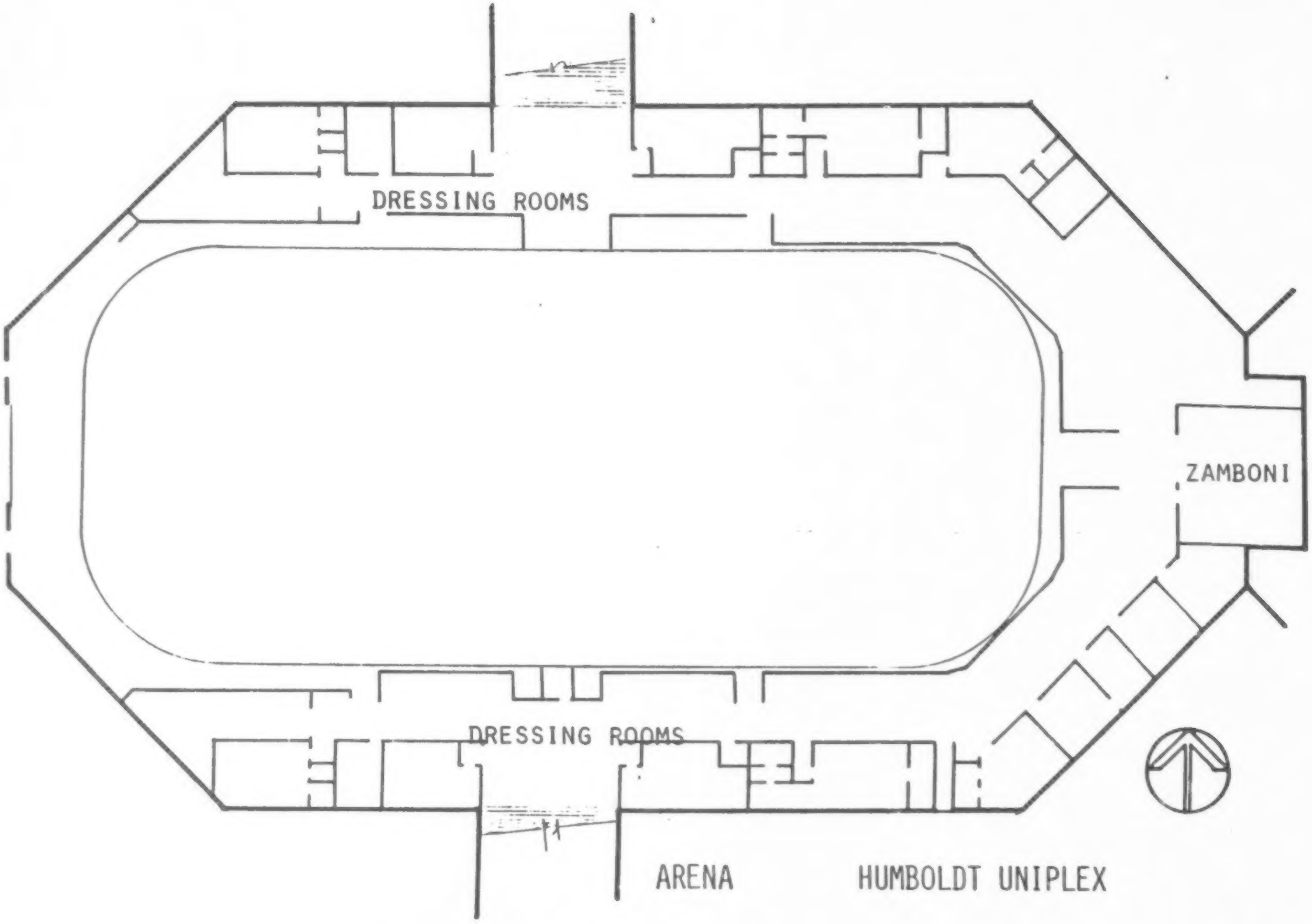
TISDALE RECREATION CENTRE



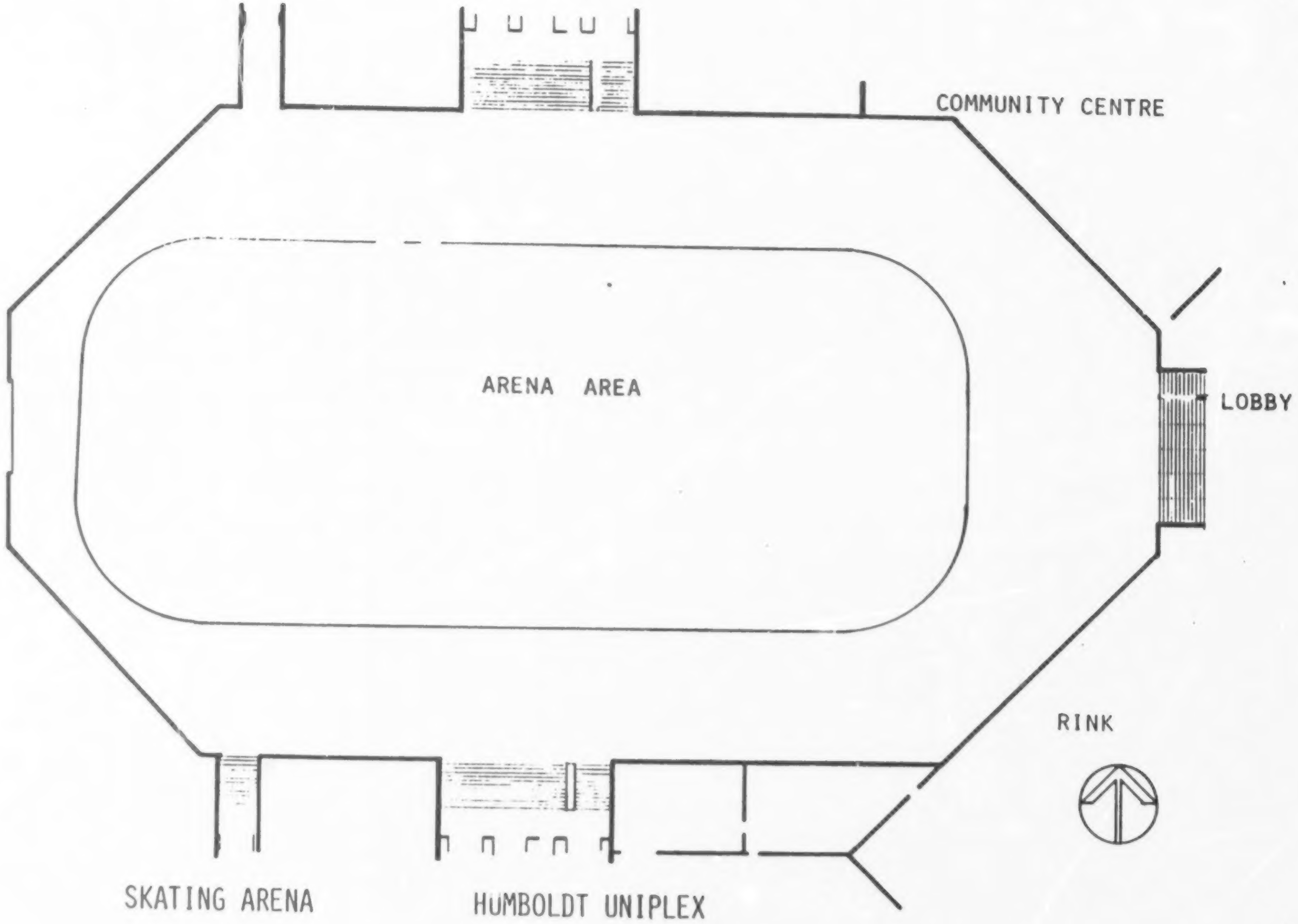
NORTH EAST ELEVATION TISDALE RECREATION CENTRE

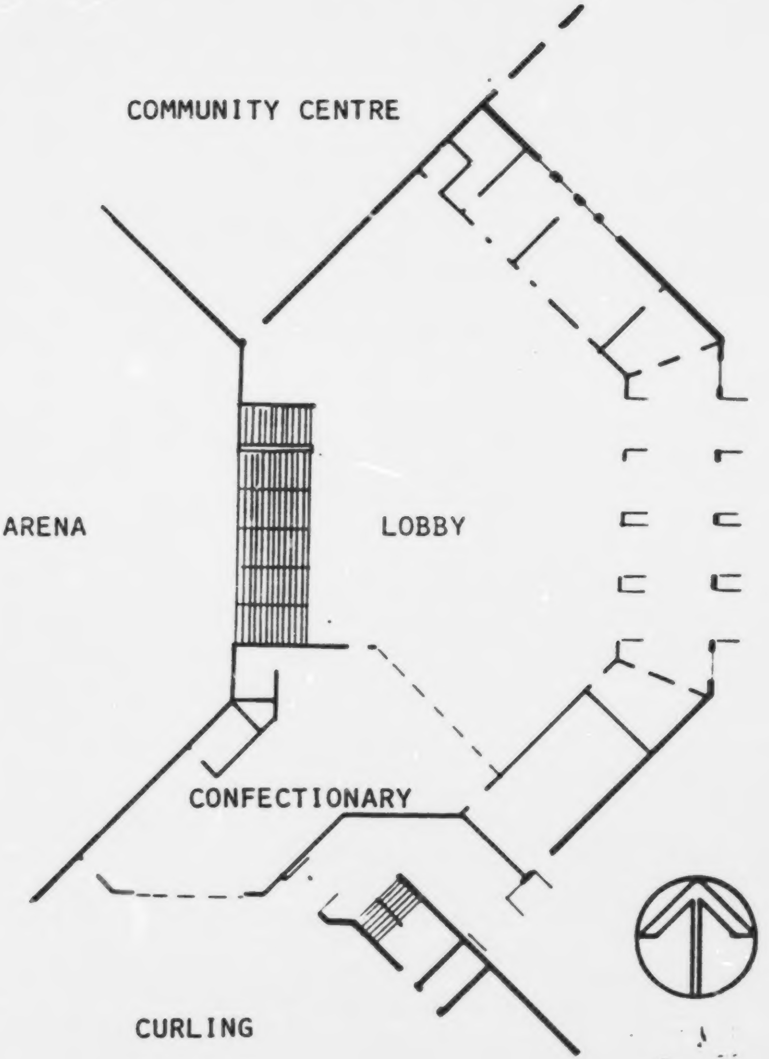

HIGHWAY #
NORTH
COMMUNITY CENTRE
LOBBY
ARENA
CURLING
7TH AVE.
6TH AVE.
5TH AVENUE

SITE PLAN. HUMBOLDT UNIPLEX.

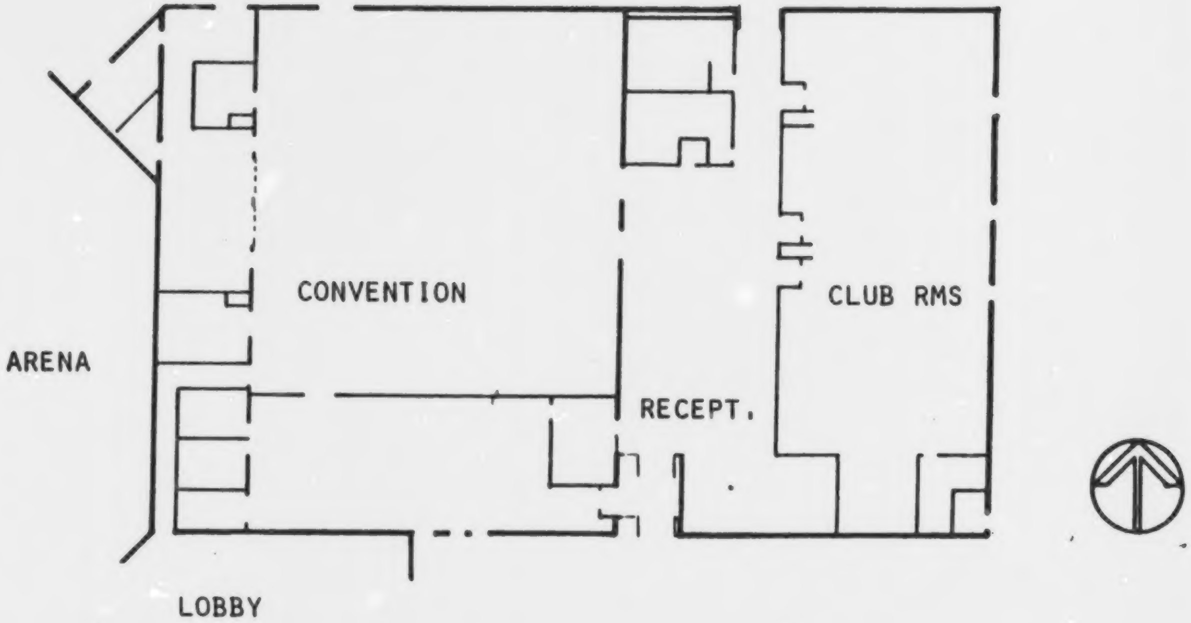

DRESSING ROOMS
ZAMBONI
DRESSING ROOMS

ARENA HUMBOLDT UNIPLEX

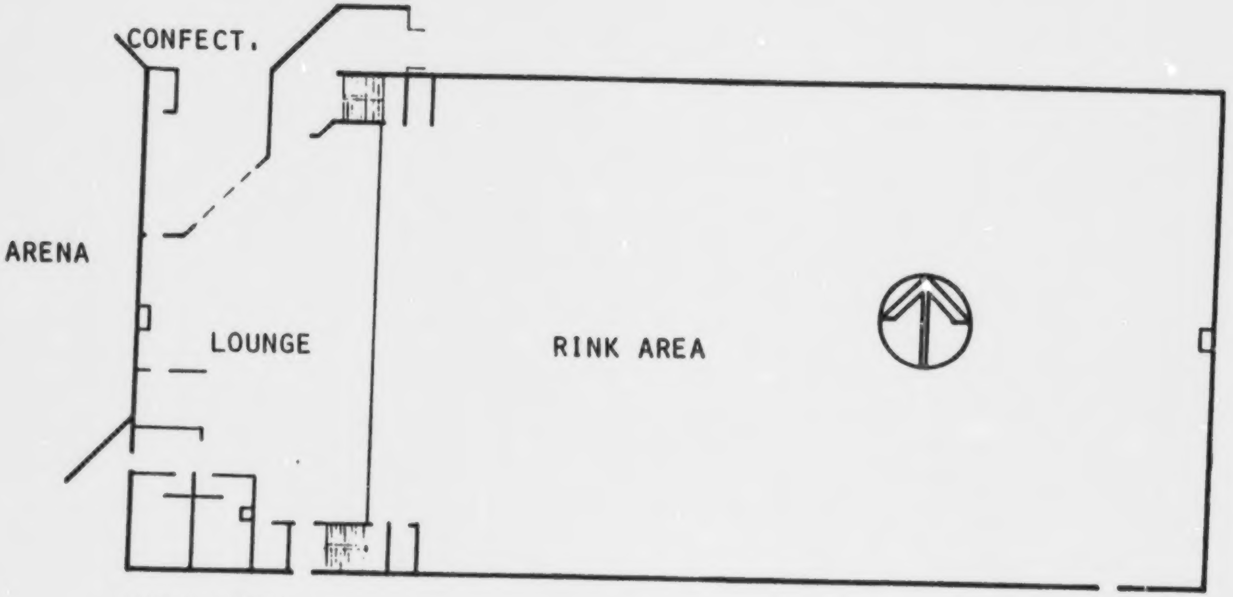

COMMUNITY CENTRE
ARENA AREA
LOBBY
RINK
SKATING ARENA
HUMBOLDT UNIPLEX


COMMUNITY CENTRE
ARENA
LOBBY
CONFECTIONARY
CURLING

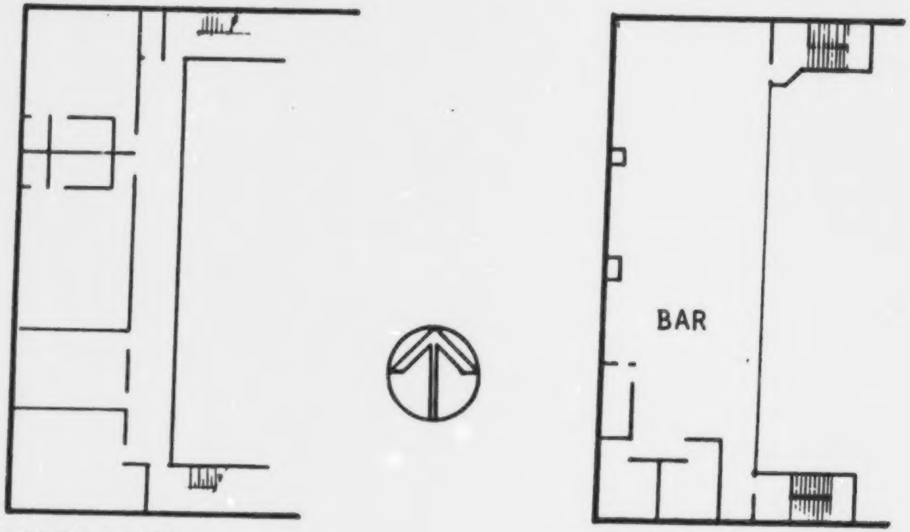
LOBBY HUMBOLDT UNIPLEX


ARENA
CONVENTION
RECEPT.
CLUB RMS
LOBBY

COMMUNITY CENTRE HUMBOLDT UNIPLEX


CONFECT.
ARENA
LOUNGE
RINK AREA

MAIN LEVEL



LOWER LEVEL

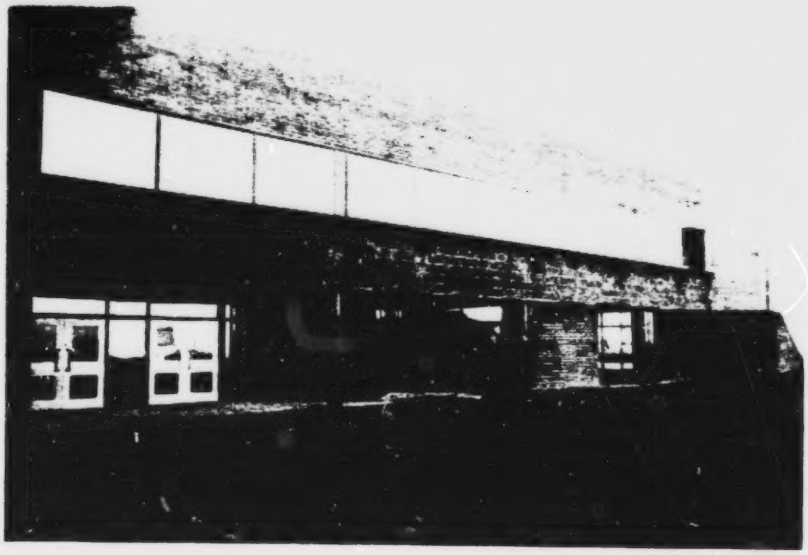
UPPER LEVEL

CURLING RINK

HUMBOLDT UNIPLEX

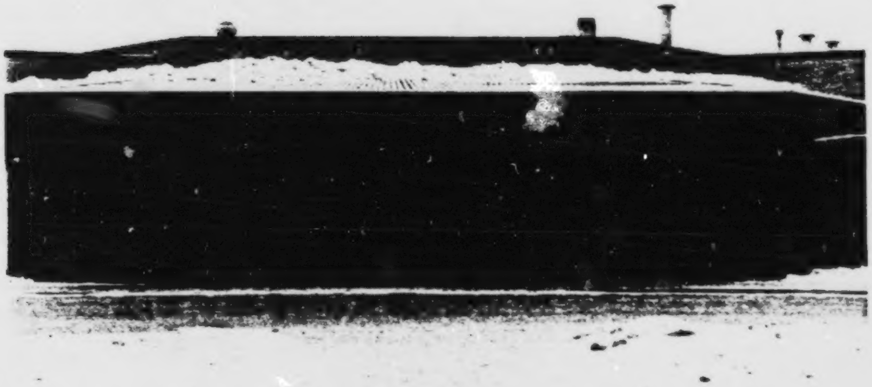
APPENDIX "G"

Photographs of Tisdale and Humboldt Complexes
(all are of Tisdale unless otherwise indicated)



north west elevation showing
ground level scalloped windowwall
the exposed 10"i.d. columns and
second floor glazing

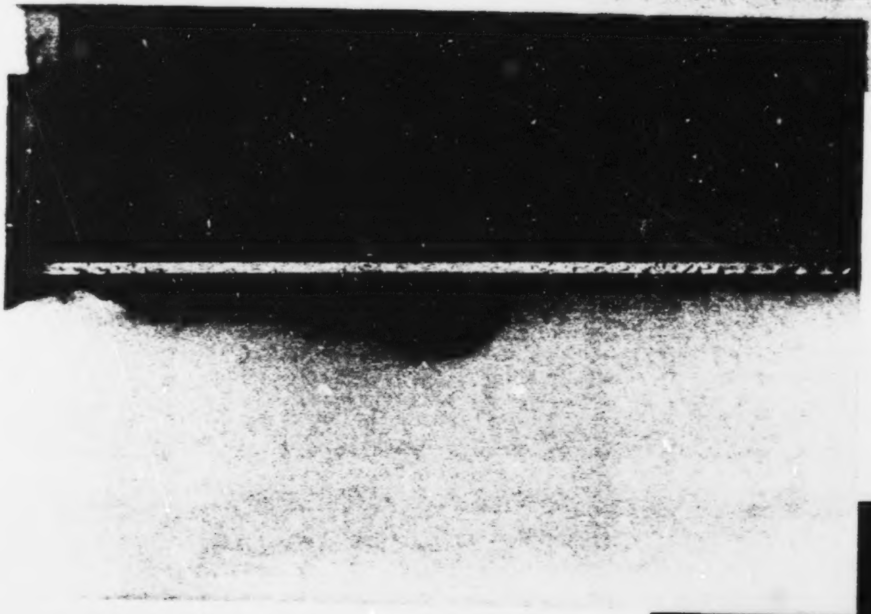
main entrance showing ice
built-up on roof at Humboldt



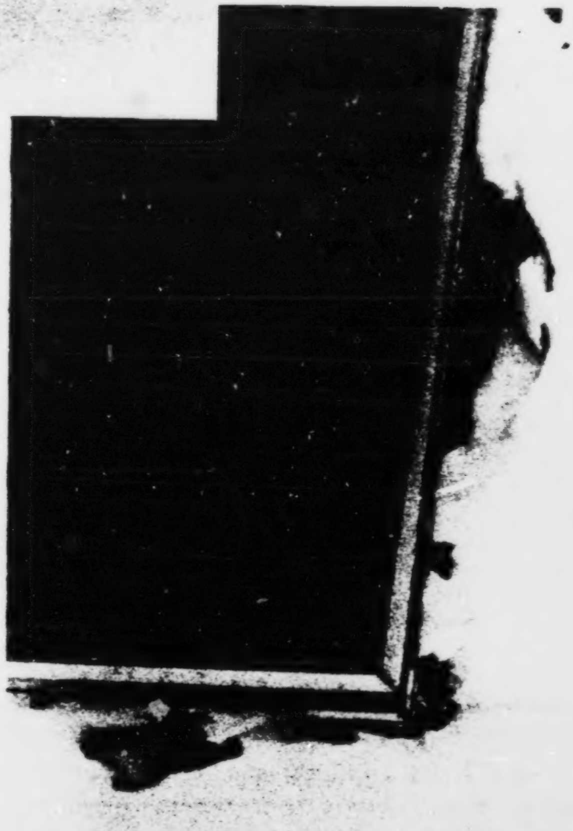
dressing rooms under bleachers
under construction (no insul.)

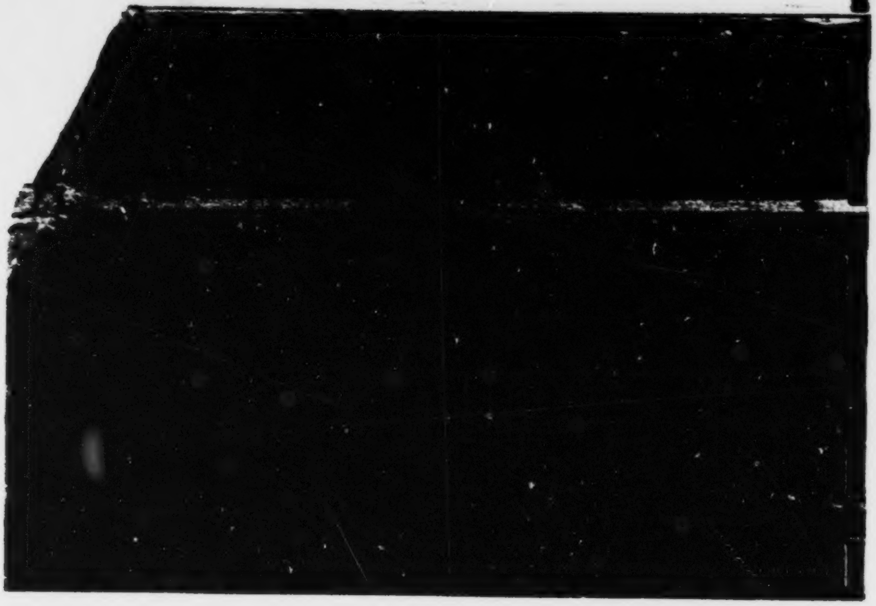
shooting gallery

main concourse showing
main entrance, mezzanine
and skilites

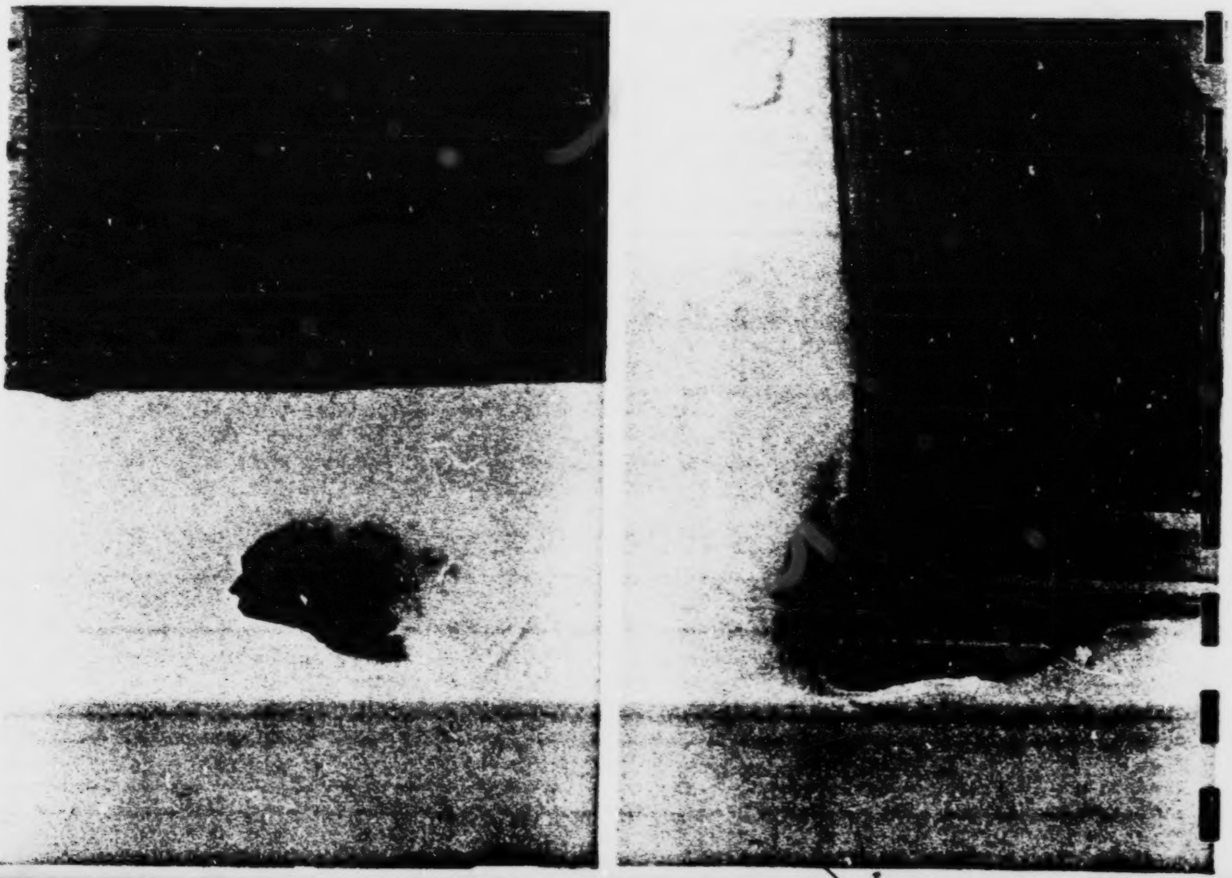


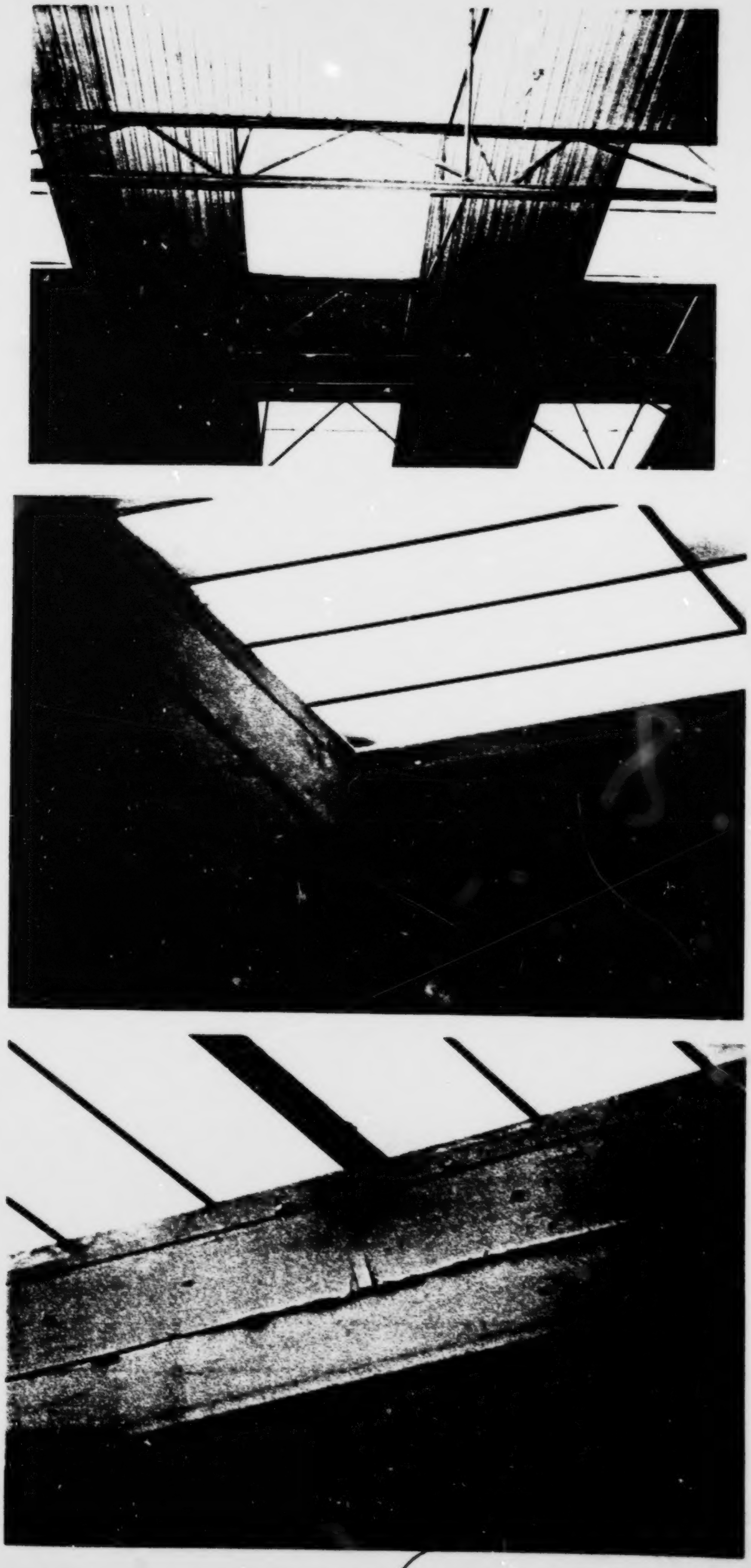
various views of Kalwal skilites showing air leakages and condensation





various views of Kalwal skilites showing air leakages and condensation

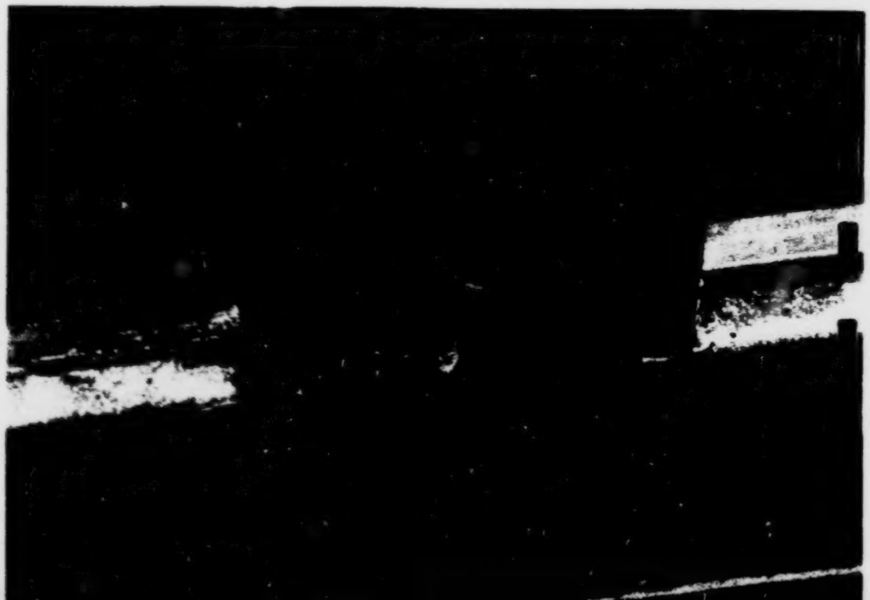


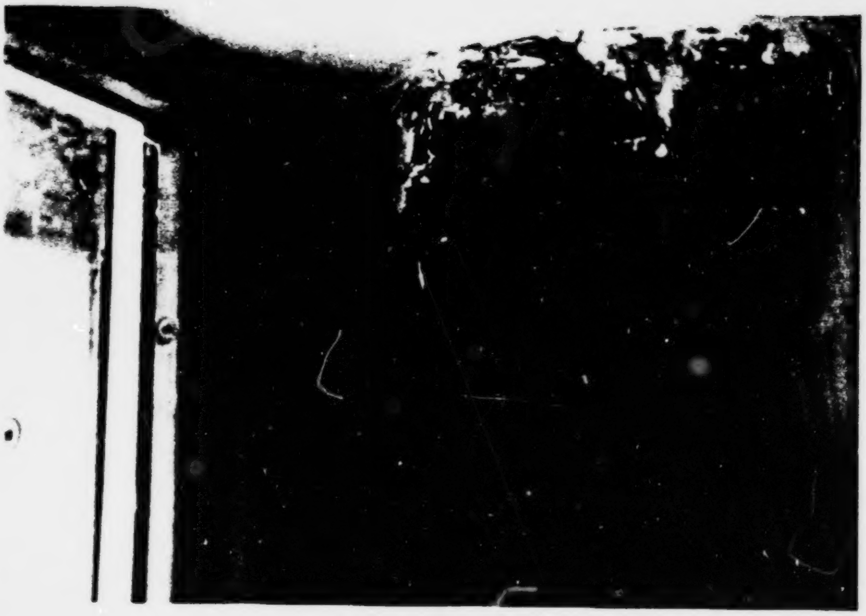


interior view of skilites
from lobby

"inside-out" windowframe at 2nd level (west window) note rust and moisture damage to wall

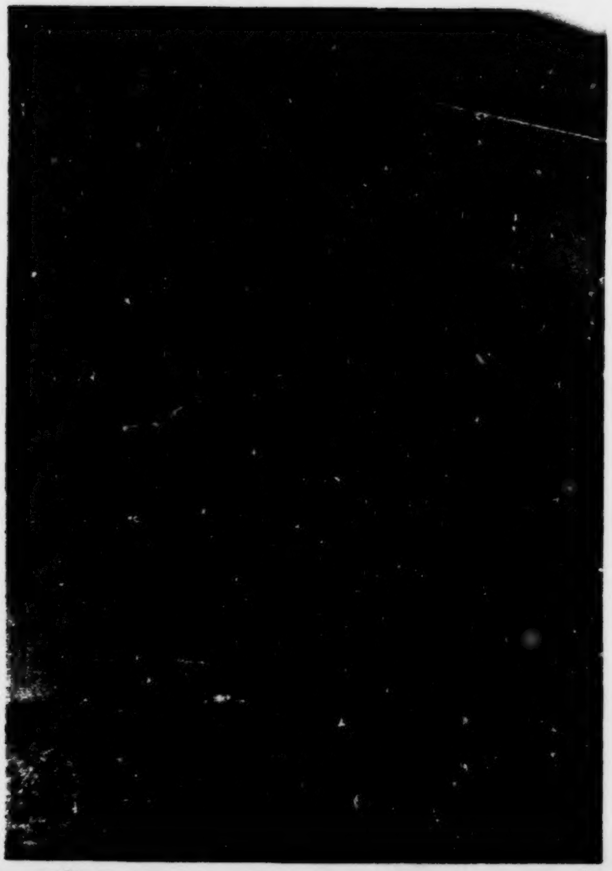
details of west window

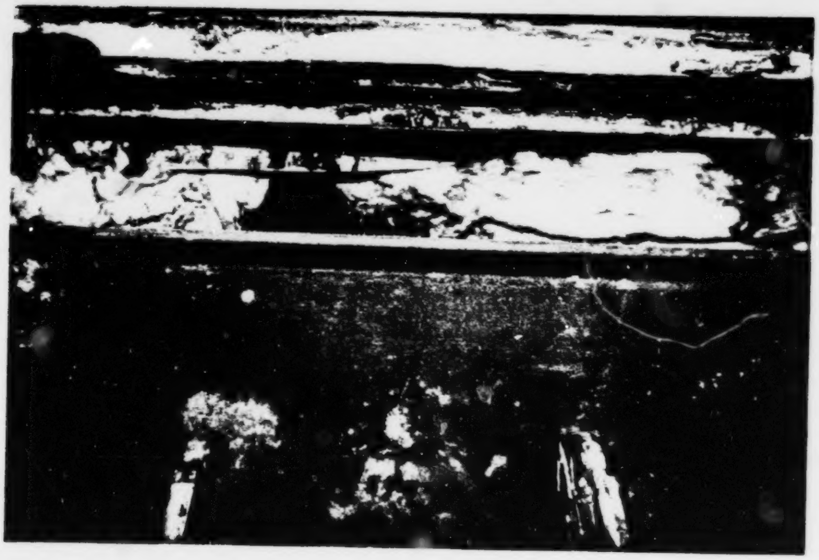




detail at ceiling (west window)

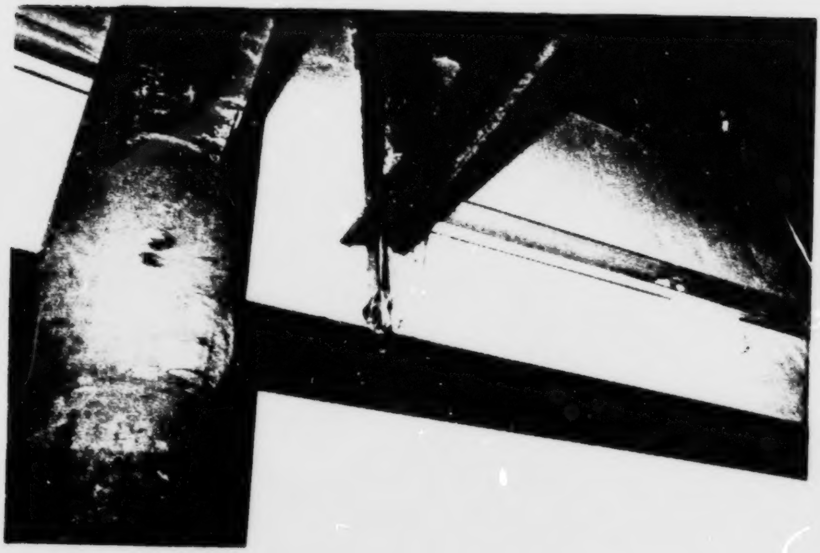
inside-out window and 10" i.d.
"cold sink" column
note moisture at floor level

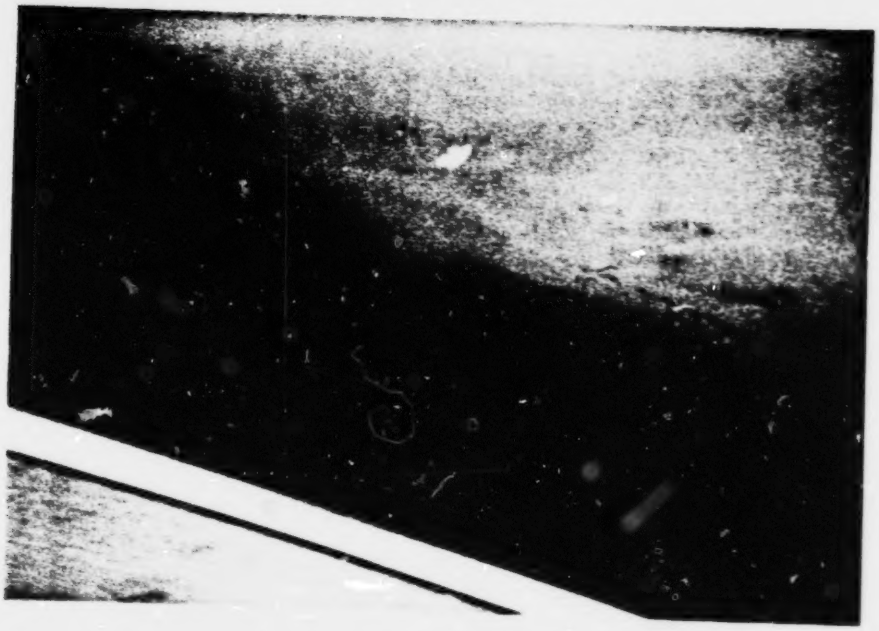




detail over ceiling space note gaps in insulation, no vapor battier.

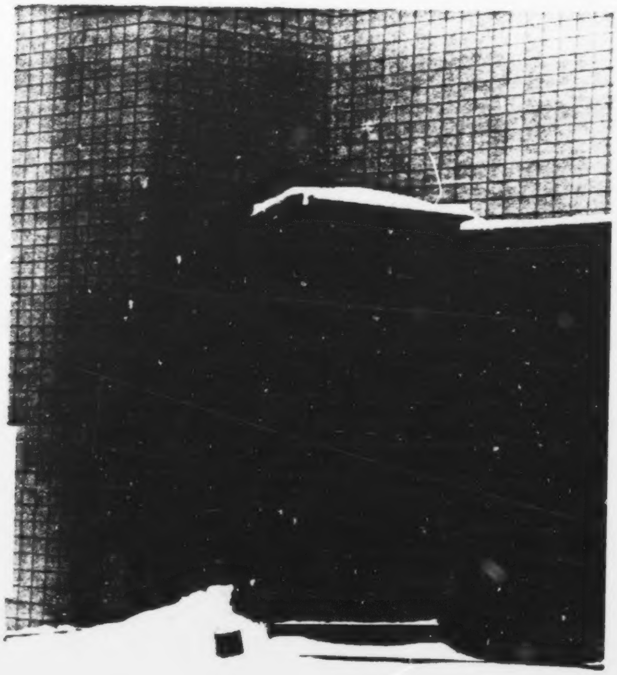
detail of ceiling at north west wall ; note absence of vapor barrier



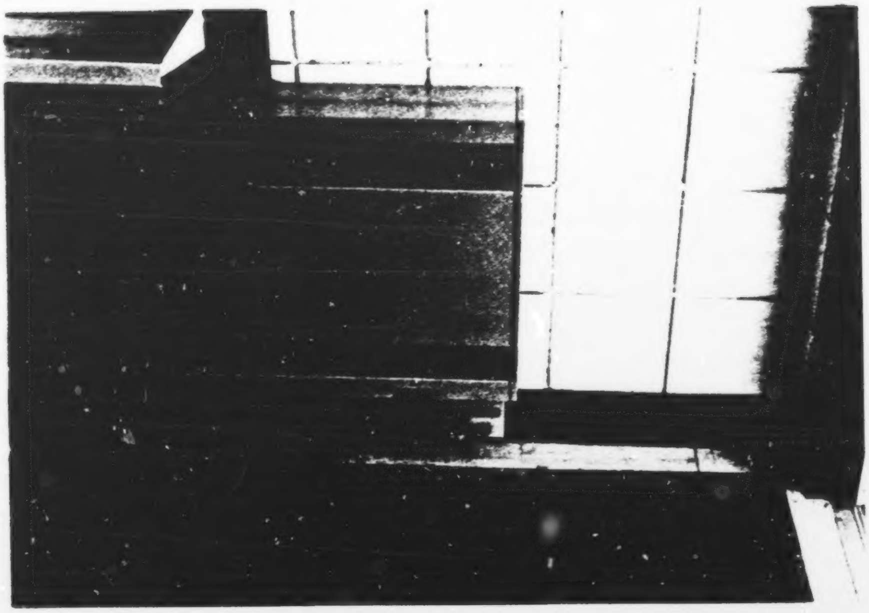


details over window (west)

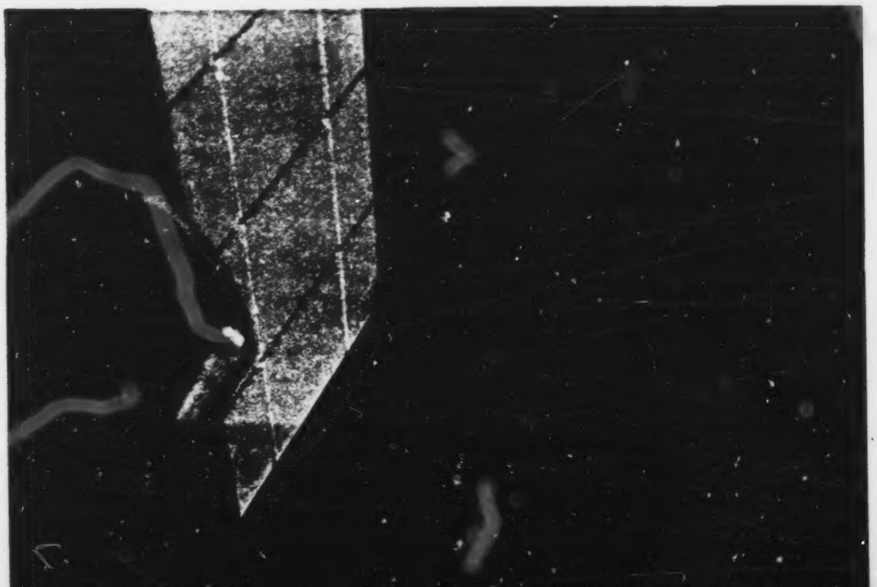
curling rink

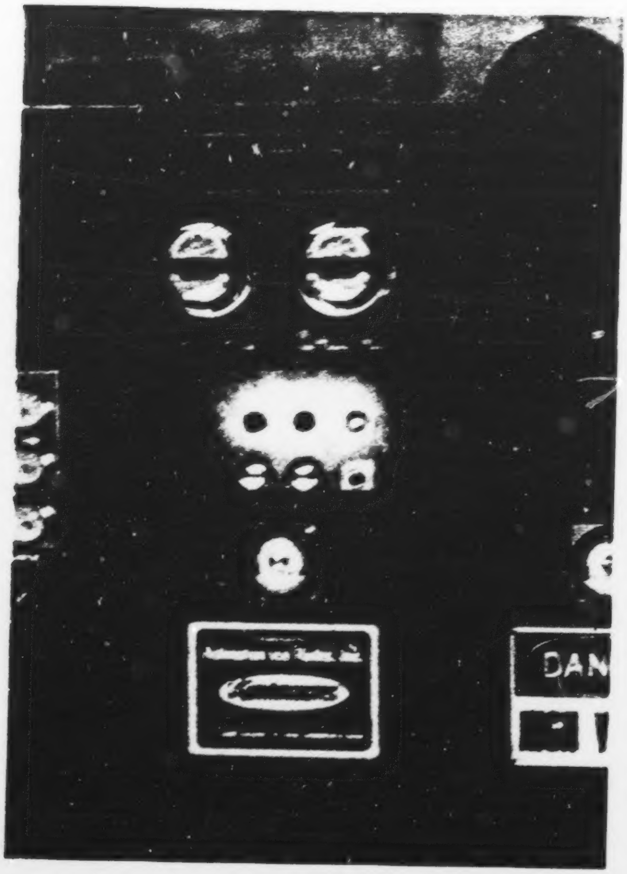


full height glazed windows to
fire exit at north exit stairs



elapsed time indicators
mounted to electrical
supply at wall heating units
(Humboldt)





electric consumption meters
(Humboldt)

TISDALE

POOR
QUALITY
ORIGINAL